

**PUBLIC SERVICE COMMISSION  
OF WISCONSIN**

Public Service Commission of Wisconsin  
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# Strategic Energy Assessment Energy 2012



## Final Report



February 2007  
Docket 5-ES-103  
610 North Whitney Way  
Madison, Wisconsin



## TO THE READER

This is the fourth biennial Strategic Energy Assessment (SEA) issued by the Public Service Commission of Wisconsin (Commission or PSC), an independent state regulatory agency, whose authority and responsibilities include regulatory oversight over electric service in Wisconsin. The SEA provides a picture of past and future electric energy needs and sources of supply. It brings to light issues that may need to be addressed to ensure the availability and reliability of Wisconsin's electric energy supply.

While the Commission is required to prepare this technical document for comments by parties involved in the electric industry, the Commission also intends that the SEA be available to the general public having an interest in reliable, reasonably priced electric energy. To assist the general public, definitions of key terms used within the electric industry are included in this report.

The Commission held a public hearing on this SEA in Madison on July 26, 2006. Comments from the public and stakeholders were also received through September 6, 2006. Load serving utilities also provided preliminary summer 2006 demand and purchase data in late August 2006. The Commission, as required made an environmental assessment on the draft SEA. It is available on the Commission's website at <http://psc.wi.gov>.

The Commission thanks the following organizations and members of the public for their comments on the draft SEA which were filed with the Commission, listed in the order they were received. All of the comments were utilized while drafting the final SEA.

Annita Wosniak, Robert Owen Jr., Department of Agriculture, Trade and Consumer Protection, Madison Gas and Electric Company, Department of Transportation/Aeronautics, We Energies, Wisconsin Power and Light Company, David Matthews, Utility Workers Coalition, Wisconsin Public Service Corporation, Wisconsin Public Power Inc., Citizens' Utility Board, RENEW, Clean Wisconsin, Industrial Customers Group, Ernest Martinson, Citizens for Responsible Energy, Steve Books, Dairyland Power Cooperative, American Transmission Company LLC, Margaret Buchberger, and Richard R. Pieper, Sr.

Questions regarding the process or requests for additional copies of the final SEA should be directed to this SEA's project manager, Christine Swailes, at (608) 266-8776. Questions from the media and the legislature may be directed to the Commission's Director of Governmental and Public Affairs, Linda Barth, at (608) 266-9600.





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# *Strategic Energy Assessment Energy 2012*

## ■ PERSPECTIVE FROM THE COMMISSION ■

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### **Maintaining Balance, Providing Rate Stability, and Promoting a Sustainable Energy Policy in an Ever Changing World**

Wisconsin has experienced a decade of activity and change in the world of energy that is unprecedented in our history.

We have moved from the monopoly utilities our parents knew to an energy network with regional, organized wholesale markets; from an era of consistent, low fuel prices to a volatile and challenging unregulated natural gas market and escalating coal and coal transportation prices; from the most serious reliability crises in our state's history to a time of record investment in energy infrastructure; and to the recognition in this country that global warming is real and that our energy policies must consider its impacts on the planet.

Through the constantly changing dynamics in energy restructuring, technologies and federal policies over the past decade, Wisconsin's balanced energy policy has kept the state on track.

As Wisconsin moves into the next decade, we can continue to expect an ever-changing energy landscape. This will require new approaches and an even stronger commitment to balanced energy policies that recognize the need to continue strengthening the reliability of energy infrastructure, keeping in mind the very real impacts escalating energy prices have had on our economy and reducing the impacts of fossil fuels on our air, land and water. Wisconsin's energy system must be well-positioned to meet the growing energy demands of the next decade in this increasingly complex environment.

To help accomplish this objective, the Commission will focus on the following strategic initiatives in 2007:

- **Environmentally sustainable energy alternatives**—Worldwide, we are experiencing the impacts on the environment of emissions from all types of sources, including power plants. In its fourth assessment since 1990, the United Nations Intergovernmental Panel on Climate Change, for the first time, asserts with more than 90% confidence that human activities are the primary cause of global warming since 1950.
- **Accountability in the regional wholesale market**—Wisconsin is part of a new, organized regional wholesale energy market. To date, significant questions regarding the benefit Wisconsin customers have received from membership in Midwest Independent Transmission System Operator (MISO) go unanswered.
- **Improved planning process**—Working with energy stakeholders, the PSC has taken some good steps in recent years to strengthen our overall energy planning process. But more can and should be done to ensure Wisconsin makes wise strategic energy investments employing a balanced portfolio approach – with the right mix of new generation, transmission, energy efficiency and renewable energy investments.
- **Utility workforce planning**—Nationally, we face a dramatic workforce challenge as baby boomers retire, taking with them their skills and knowledge. This workforce exodus will be even more keenly felt in the utility industry. The reliability of Wisconsin's energy network depends on our ability today to attract and train tomorrow's utility workforce.





## ■ BUILDING ENERGY RELIABILITY ■

### **The Late 1990's: Uncertainty and Reliability Problems**

In the late 1990's Wisconsin experienced severe energy reliability challenges. Throughout 1997 and 1998, threats of blackouts and energy shortages were a daily occurrence in many parts of the state. In fact, since the mid-1980's and through the 1990's, Wisconsin did not make any investments in our transmission or baseload generation infrastructure.

The Wisconsin Legislature responded and provided state policies to address uncertainties, electric reliability and needed infrastructure which included a move away from the *Advance Plan* process to the *Strategic Energy Assessment* process, creation of an independent transmission company, revising utility shared revenue payments to encourage local governments to site needed energy infrastructure, enacting ETF legislation to support innovative financing options for utilities and streamlining the siting and permitting process.

Wisconsin improves reliability of state's generation and transmission infrastructure.

### **Unparalleled Energy Building Cycle**

Working with Wisconsin utilities, the PSC has also responded to the reliability challenges of the late 1990's. The PSC has reviewed and approved the following infrastructure improvements to address our reliability challenges and to help meet future demand:

- Since 1997, Wisconsin has added over 4,500 megawatts of natural gas-fired generation to meet peak demand.
- Since 1997, the PSC has approved 1,300 miles and \$1.4 billion in new high voltage transmission, the first high voltage lines approved in Wisconsin in 35 years.

- Since 2003, the PSC approved nearly 2,000 megawatts of baseload generation, the first new baseload generation approved in Wisconsin in 25 years. These new units work more efficiently and have lower emissions than existing coal generators.
- The PSC has approved over 400 megawatts of wind generation.

The differences between Wisconsin's energy system in the 1990's and today are clear. The results of the policy decisions and investments in our energy infrastructure are further described in this *Strategic Energy Assessment*.

Wisconsin is now ahead of the reliability curve as our neighbors to the east, west and south are just now looking to start major new generation and transmission construction projects.

And Wisconsin has avoided the instability and rate shock that has accompanied the rush to deregulate the energy industry in the late 1990's and early in this century. While we have embraced wholesale markets -- and wisely so for a state that continues to import over 15 percent of our energy -- many of the states that deregulated have not realized their goal of increasing competition and lowering costs for ratepayers.

Under many states' deregulation plans, residential rates were frozen for several years, making the current transition to market-based electric rates a shock for most ratepayers in those states.

*Energy 2012* points out, "...the ability to make rate comparisons between these states is not straightforward. The comparison to Wisconsin rates in some cases is often an apples to oranges exercise as bankruptcy and financial instability is a risk that the Wisconsin regulatory approach does not create."

**Wisconsin is ahead of the curve and continues to move forward.**

**PSC Review Process is Key Component of Wisconsin's Energy Policy**

State law has established an independent review process for the Commission to follow in reviewing energy construction projects that require a thorough examination of the need for the project as well as an examination of alternatives to the project and the related environmental and public health concerns.

This transparent review process encourages participation from the public and from non-profit organizations, and provides funding to help organizations participate.

With the new electronic filing system on the PSC's website (<http://psc.wi.gov/>), all the information filed with the PSC in a contested case is just a click away.

The PSC review process and day-to-day monitoring of Wisconsin's energy system are key components of Wisconsin's overall energy policy.



## **Next Step: Find New Tools to Provide Continued Rate Stability for Wisconsin Customers**

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The Commission is acutely aware of the real impact rate increases have on Wisconsin's energy consumers, and that increases tend to overshadow the system value derived from infrastructure improvement in this major building cycle. The Commission will continue to do everything within its power to minimize rate inflation while ensuring the current and future integrity of the electricity generation and transmission system.

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**Rate Stability**—The Commission is working with utilities to encourage them to file for rate increases on a two-year basis, rather than every year. A biennial rate case will require better planning on the part of the utilities and provide more stability in rates.

**Demand Response Programs**—Wisconsin citizens can individually take steps to lower their utility bills and impacts on the environment, as well. The PSC will work to provide them the tools, such as demand response programs. Demand response programs include voluntary programs for turning residential air conditioners off during periods of high demand or special tariffs for big industrial consumers who agree to power interruptions during such periods.

**Wisconsin consumers get help in reducing energy use and lowering utility bills.**

The PSC will take the following steps to help consumers take control of their energy bills:

- Include demand response in the analysis of our overall generation capacity planning and as a factor in setting a statewide generation planning reserve margin.
- Coordinate Wisconsin's demand response programs with the regional transmission operator, MISO, so that participants in demand response programs are compensated for reduced or altered consumption according to the market value of electricity or the infrastructure needed to generate and deliver electricity.

Even though Wisconsin is a national leader in demand response programs, we can do even more to empower energy customers to make wise, informed energy decisions to lower their individual electric bills and impact on their environment, too.

**Calling for More Innovations**—As part of several recent rate orders, the Commission called on a major Wisconsin utility consumer advocacy group, the Citizens Utility Board (CUB), to work with utilities to find more innovative programs to help consumers lower their utility bills. Programs like time-of-day pricing, where consumers can decide to use more electricity when demand is low and energy prices are lower, are the types of programs this collaboration will review.

**18 Percent Reserve Margin**—At the *Energy 2012* public hearings there was broad support for an analysis of the 18 percent reserve margin. The Commission will open a docket to review the 18 percent planning reserve margin to see if the requirement best serves Wisconsin given the implementation of the Day 2 Market and other developments focused on better pooling of generation resources regionally. The docket will also analyze whether other states within the MISO footprint with lower reserve planning margins are “leaning” on Wisconsin to make up the difference. The Commission will look to see if reliability can be maintained for Wisconsin customers at a lower reserve margin and help to lower costs.





## ■ FOCUSING ON A CLEANER, SUSTAINABLE ENERGY FUTURE ■

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New strategies are imperative for dealing with the environmental impacts of generating electricity from fossil fuels. We must find more sustainable energy alternatives, advance new and better technologies and prepare for living in a carbon-constrained world. Wisconsin is positioned to take a leadership role in creating a cleaner, sustainable energy future.

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### **A Major Step in Dealing with Global Warming: Energy Efficiency and Renewables**

**Governor Doyle signs largest energy efficiency and renewables legislation in state history.**

When Governor Doyle signed 2005 Wisconsin Act 141 into law, he signed the most sweeping energy efficiency and renewables policy change in Wisconsin's history and took a major step toward addressing global warming.

The new law requires Wisconsin utilities to move to more renewable sources of energy to generate electricity, 10 percent by 2015. It also restructures the statewide energy efficiency program, providing more funding and a stronger coordination role for the PSC.

A report issued in Fall 2005 showed that Wisconsin could save enough electricity through conservation to defer construction of one power plant every five years and to replace enough natural gas to heat as many as 65,000 homes each year.

Under the new standards set in Act 141, by 2015, Wisconsin will be generating enough electricity from renewable sources to supply the needs of 850,000 homes in Wisconsin. We will avoid producing over 5.5 million tons of greenhouse gases.

## Next Steps: Take Global Warming Head On

Act 141 is a good start, but more must be done. In the future, the Commission will consider the economies of a likely carbon constrained world as part of the assessment process for siting new electric generation. The Commission will also support the initiatives announced by Governor Jim Doyle.

The Governor recently challenged us all to take responsibility to reduce contributions to global warming. And he has led by example, launching a major bio energy and bio fuels initiative and setting a goal of producing 25 percent of our energy from renewable sources by 2025.

### Governor's Office of Energy

**Independence**—The Governor has proposed creating an Office on Energy Independence to coordinate the state's efforts to grow Wisconsin's bio and renewables economies. The new Office will advise the Governor on steps the state can take to meet his energy independence goals.

### Governor's Task Force on Global

**Warming**—There is no question that global warming demands immediate action. The Task Force on Global Warming will be charged with exploring state and local solutions to global warming. Members of the Task Force will represent Wisconsin businesses, industry, environmental organizations and government.

### Fossil Fuels Impact the Environment

The year 2006 was the warmest year in the U.S. in the past 100 years, according to the National Oceanic and Atmospheric Administration (NOAA).

NOAA said a contributing Factor to the warm temperatures in 2006 and the long-term warming trend is linked to increases in greenhouse gases.

Gases that trap heat in the atmosphere are often called greenhouse gases. Carbon dioxide is the primary greenhouse gas and is emitted mainly from power plants and automobiles.

### Clean Coal Technology

IGCC uses high pressure and temperature to transform coal into a gas prior to combustion. The resultant gas can be cleaned of pollutants prior to firing in a turbine. Conventional coal technology burns coal in a boiler, and pollutants must be stripped out after combustion in the exhaust, which is both a more difficult and expensive process. IGCC also has lower emissions of sulfur dioxide, which contributes to haze, acid rain and the formation of fine particulate pollution.

And the PSC will continue to explore new technological solutions:

**Clean Coal Technology**—Increased energy efficiency and use of renewable energy sources moves Wisconsin towards more independence from fossil fuels. However, as Energy 2012 reports, Wisconsin generates more than 60 percent of its electricity from coal. Wisconsin's dependence on coal to generate electricity requires additional environmental strategies involving new clean coal technologies, especially considering the likelihood of Congressional action on carbon emissions.

The Department of Natural Resources and the PSC recently released a report which indicates that in a carbon constrained world clean coal technology, integrated gasification combined-cycle (IGCC), holds promise as part of Wisconsin's next generation of baseload power plants. This report will be an important tool for the Governor's Task Force on Global Warming and the Commission as we address global warming.





# BRINGING THE BENEFITS OF A ■ REGIONAL ENERGY MARKET HOME ■ TO WISCONSIN RATEPAYERS

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Serious questions still remain throughout the country regarding consumer benefits of participation in wholesale energy markets. Here in Wisconsin, the PSC has for the last 18 months strongly urged MISO to develop transparent cost/benefit analysis to answer the same. MISO's recent report still fails to answer the basic question of whether Wisconsin consumers are benefiting from membership in MISO.

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## **The Most Significant Change this Decade: MISO**

April 1, 2005 was a day that marks the most significant change to the energy system in Wisconsin in the past decade. It is the day that the Midwest Independent Transmission System Operator (MISO) implemented day-ahead and real-time regional electricity markets, collectively known as the “Day 2 Market.”

MISO centrally dispatches generation and operates the wholesale electric market based on real-time availability of generation and transmission resources across a footprint that includes 15 states in the Midwest and a province in Canada.

The PSC and Wisconsin energy stakeholders have worked together to make sure Wisconsin's voice is heard in this new regional approach to electric wholesale markets and to assure Wisconsin ratepayers benefit.

But as *Energy 2012* explains, “The experience under MISO Day 2 has not been fully evaluated. The market is new and the learning curve of both MISO and the MISO participants is long and complex.”

### Next Steps: Call for Real Answers on the Benefits of the Regional Energy Market for Wisconsin Ratepayers

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After nearly two years of requesting MISO to provide a clear cost/benefit analysis of the new wholesale energy market, MISO recently released a study that still leaves questions unanswered. Wisconsin stakeholders and the organization of MISO States continue to believe the study methodology is flawed and, as a result, the benefits of the regional market are unproven. The PSC will work with Wisconsin stakeholders to produce a Wisconsin-specific cost/benefit analysis of MISO's Day 2 Market to explore the benefit to state ratepayers. The PSC will also create a new Office of Wholesale Energy Economics and Finance to focus the PSC efforts in making sure that regional wholesale markets benefit Wisconsin customers.

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**A Wisconsin Cost/Benefit Study**—Wisconsin has aggressively pushed MISO to answer in concrete terms the questions that remain regarding the benefits of the Day 2 Market to Wisconsin ratepayers. These are fundamental questions that could have a major impact on ratepayers in the entire MISO region, including Wisconsin.

**Wisconsin will continue to look into possible benefits of regional market and performance of MISO.**

It is time for answers. The PSC will work with energy stakeholders in the state to conduct a Wisconsin-specific study to help us better understand the impact of the new market on reliability, electric service and ratepayers. The study will help the Commission determine whether this regional market design benefits energy consumers here and to develop strategies regarding future participation.

**PSC Office of Wholesale Energy Economics and Finance**—The PSC will reorganize expert staff to create an Office of Wholesale Energy Economics and Finance. It will provide a new approach in Wisconsin to focus on the function of the wholesale market, MISO, the Organization of MISO States and the Federal Energy Regulatory Commission. The new Office will report directly to the PSC Chairperson and provide better coordination of the PSC efforts to push aggressively and effectively to ensure that regional markets benefit Wisconsin customers.





# KEEPING A FOCUS ON FUTURE ■ RELIABILITY THROUGH IMPROVED ■ ENERGY AND WORKFORCE PLANNING

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Wisconsin needs to step up its energy planning process to make sure we are positioned to meet the challenges and opportunities that grow from new energy technologies, changing federal regulations and efforts to lower environmental impacts. We must always keep one eye on the horizon to ensure we have a reliable energy system, at reasonable rates and with as little impact on the environment as possible. A key part of planning for the future is to make sure Wisconsin has a trained utility workforce in place.

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## Continuing to Improve Wisconsin's Energy Planning Process

Since the late 1990's, Wisconsin's energy planning process has been evolving. Starting in 1998, the Legislature created the biennial *Strategic Energy Assessment* and called on the PSC to take a three-year snapshot of energy needs and provide an analysis focused on the viability of energy wholesale markets.

State  
enhances  
energy study  
to look further  
into the  
future.

In 2003, the PSC modified the SEA by requiring a more comprehensive longer term energy planning process. The enhanced *Strategic Energy Assessment, Energy 2010*, provided a vehicle that looked further into the future, discussed broader policy issues and encouraged public participation. The enhanced *Strategic Energy Assessment* process has been a useful energy planning tool for policymakers and was the catalyst for a number of important steps:

- **Access Docket**—The PSC, energy stakeholders and the public took a comprehensive look at statewide transmission needs, especially with respect to potential transmission upgrades designed to reduce transmission congestion and provide greater access to electricity supplies outside Wisconsin.



- **Cost of Service Study**—The PSC, energy stakeholders and the public closely examined cost drivers, rate structures, and strategies for maintaining fair and efficient utility pricing.
- **2005 Wisconsin Act 7**—*Energy 2010* suggested the need for another financing tool for energy construction projects that contains both the advantages of rate-based financing for lower impact on ratepayers and the certainty of leased-base financing. The result was a bipartisan legislative effort that led to a new state law.

Like *Energy 2010*, *Energy 2012* provided the forum for a number of important recommendations outlined here to improve Wisconsin's energy future. However, Wisconsin needs to step up its energy planning process; the ever-changing world of energy dictates that need.

### **Next Step: It's Time to Revamp Wisconsin's Energy Planning Process**

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**Wisconsin's planning process should provide the tools to help make wise energy investments, provide rate stability, effectively participate in regional wholesale energy markets, and thrive in a carbon-constrained world.**

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**Technical Conference on Planning**—The PSC will convene a Technical Conference on Planning to help develop a new holistic, regional approach to energy planning that includes better coordination of plans for new generation, transmission, energy efficiency and renewables. As part of the Energy 2012 process, the Commission received a number of suggestions from environmental and consumer advocates that should also be considered as we look at a new energy planning process. Some of those suggestions include:

- Using externality costs in the analysis
- Setting the forecast further out in the future
- Providing public input up front in the process
- Increased analysis of utility energy forecasts

By remaining open to an energy planning structure that encompasses both long-term forecasting and shorter-term circumstances and developments, the Commission will continue to provide a regulatory structure that keeps Wisconsin on the right track and lays the groundwork to meet our energy independence goals.

## Utility Workforce Planning Essential to Future Reliability

Reliability in the energy system is not just about the steel and concrete used to build new infrastructure. It is also the men and women who work daily to build and maintain a safe energy network. The technical skills needed to construct, run and maintain our energy system are honed through many years of training and on-the-job experience.

Like so many other sectors in this country's workforce, the utilities have an aging workforce and could soon see a large number of skilled technicians reaching retirement with very few employees ready to take their places.

*Energy 2012* reports that, according to the Utility Workers Coalition, between 2005 and 2010 Wisconsin utilities will see the retirement of approximately 700 highly skilled workers and a total retirement of more than 1,300 highly skilled workers by 2015. The Coalition points to a HayGroup Working Paper which reports: "The utility industry is facing the most significant and complex threat to its survival ever. From the Executive Suite down to the lineman, significant numbers of mission-critical employees are rapidly approaching retirement eligibility. On average, these employees are older than their counterparts in other industries and represent approximately 50 percent of the industry's knowledge assets."

## Next Step: Develop a Comprehensive Plan to Address Utility Workforce Issues

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**Effective utility workforce planning is essential to the future reliability of Wisconsin's energy network.**

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**Utility Workforce Planning Partnership**—The PSC is working with the Wisconsin Department of Workforce Development to start to address utility workforce issues. The agencies' goals are to identify the key issues, look at current training resources and bring stakeholders together to develop a comprehensive plan. Training tomorrow's utility workforce will continue to be a focus for both agencies.





## ■ MAINTAINING BALANCE IN THE EVER-CHANGING WORLD OF ENERGY ■

Wisconsin's energy policy has kept the state on the right track during a time of significant changes in the energy world. It has helped provide for needed investments in energy infrastructure and increased system reliability.

### **Maintaining Balance, Providing Rate Stability, and Promoting a Sustainable Energy Policy in an Ever Changing World**

The next steps we take are critical to Wisconsin's long-term energy reliability, natural environment and ability to effectively participate in regional energy markets.

In 2007 the PSC will implement a series of new initiatives to:

- Reduce the impacts of fossil fuels on our environment and meet our energy independence goals
- Ensure that Wisconsin ratepayers see the benefits of regional wholesale electric markets through our participation in MISO
- Assure future reliability and energy independence through effective, more comprehensive planning, including utility workforce planning

These steps will help maintain a balanced energy policy and sustain our environment—keeping Wisconsin on the right track in the ever-changing energy world.





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# STRATEGIC ENERGY ASSESSMENT REPORT

## 2006-2012 ELECTRICITY ISSUES

### Study Scope

The Public Service Commission of Wisconsin (Commission or PSC) is required to prepare a biennial Strategic Energy Assessment Report (SEA) that evaluates the adequacy and reliability of Wisconsin's current and future electrical supply.

The SEA intends to identify and describe:

- All large electric generating facilities for which an electric utility or merchant plant developer plans to commence construction within seven years.
- All high-voltage transmission lines for which an electric utility plans to commence construction within seven years.
- Any plans for assuring that there is an adequate ability to transfer electric power into or out of eastern Wisconsin, and the state as a whole, in a reliable manner.
- The projected demand for electric energy and the basis for determining the projected demand.
- Activities to discourage inefficient and excessive power use.
- Existing and planned generation facilities that use renewable energy sources.

The SEA is required by statute to assess:

- The adequacy and reliability of purchased generation capacity and energy to serve the needs of the public.
- The extent to which the regional bulk-power market is contributing to the adequacy and reliability of the state's electrical supply.
- The extent to which effective competition is contributing to a reliable, low-cost, and environmentally sound source of electricity for the public.
- Whether sufficient electric capacity and energy will be available to the public at a reasonable price.

The SEA must also consider the public interest in economic development, public health and safety, protection of the environment, and diversification of sources of energy supplies.

## **Study Methodology**

Under statutory and administrative code requirements, every electricity provider and transmission owner must file specified historic and forecasted information. The draft SEA must be distributed, by July 1 of each even-numbered year, to interested parties for comments. Subsequent to hearings and receipt of written comments, the final SEA is issued. In addition, an Environmental Assessment, which includes a discussion of generic issues and environmental impacts, has been issued in connection with the SEA.

This fourth SEA covers the years 2006 through 2012. It has been assigned the Commission docket 05-ES-103. During the past year, ten large Wisconsin-based investor-owned utilities, cooperatives, municipal electric companies, and other electricity and transmission providers submitted historic information regarding statewide demand, generation, out-of-state sales and purchases, transmission capacity, and energy efficiency efforts. In addition, these entities provided forecasted information through 2012.

## **Study Limitation**

The SEA is an informational study that provides the public and stakeholders with relevant trends, facts and issues affecting the state's electric industry. The SEA is not a prescriptive report, meaning that the ideas, facts, projects, and policy discussions contained in this report have not been approved for implementation or construction by the Commission. State law precludes such action, specifically Wis. Stat. § 196.491(3)(dm). Should a specific topic warrant further attention with the intent of Commission action, the Commission must take additional steps as authorized by law.

## **Overview of Contents**

The remainder of this report describes, illustrates and summarizes the information filed with the Commission by public utilities serving Wisconsin, by other interested participants in February 2006, at a public hearing held in July 2006 and in comments filed during the summer of 2006. This summary information includes:

- Historic, current, and forecasted electricity markets, as reflected in the information provided by the industry participants and, where appropriate, supplemented by Commission staff.
- Wisconsin's generation system, including expected changes.
- Wisconsin's transmission system, including the current operation of the system, expected changes, and challenges to the operation of the system.

- Descriptions of Wisconsin's energy future, with emphasis on the four assessments required by the statutes.
- Current and proposed efforts to conserve energy.
- The diversity of fuel used to generate the energy that is consumed and the effects of the entire electric system on public health, safety and the environment.
- Summarized rate and cost trends.
- Questions and summarized comments about the challenges facing Wisconsin's electric industry.





## EXECUTIVE SUMMARY

### Demand and Supply of Electricity

- The overall trend in peak demand growth is estimated to be approximately 2.35 percent per year through 2012. This represents incremental demand increases roughly equivalent to a major power plant of about 500 megawatts (MW) every two years. In 2006, Wisconsin experienced a new record peak demand level of 15,166 MW. This new record peak exceeded the prior peak demand by 771 MWs.
- Over 1,300 MW of new generation capacity became commercially available in Wisconsin in 2005, and over the next five years, through 2010, over 3,000 MW of additional, new generation is expected to be brought into service.
- The new generation will reduce Wisconsin's reliance on the currently congested transmission grid connections to Illinois and will maintain a robust planning reserve margin through 2012.
- Significant progress has been made by electricity providers in meeting the 18 percent planning reserve margin requirement. Wisconsin will very likely have adequate supply resources in the 2007-2012 timeframe.
- Generation ownership has changed. In 2005 the Commission approved the sale of the Kewaunee Nuclear Power Plant to Dominion Energy Kewaunee, a subsidiary of Dominion. Also, independent power producers have been active in developing wind projects in Wisconsin.
- There are approximately \$1.8 billion dollars of new high voltage line and upgrade projects currently proposed to be constructed and completed over the next seven to ten years. Also, there are approximately 200 miles of new right-of-way (ROW) proposed during this time period, excluding projects with applications already filed.

### Energy Efficiency and Renewable Resources

- 2005 Wisconsin Act 141 was recently enacted and will substantially revise the funding and structure of energy efficiency and renewable resource programs in Wisconsin. The legislation is based on the recommendations of the Governor's Task Force on Energy Efficiency and Renewables.
- There are several sources of renewable generation presently in Wisconsin. In addition the state's energy utilities and independent power producers (IPP) have proposed ten new wind power projects for construction in the next several years.

**Public Health and Safety and Environmental Protection**

- Different power plant technologies and fuels used to fulfill the state's energy demand produce tradeoffs between public health and environmental impacts versus need and cost. As part of Conserve Wisconsin, Governor Doyle has asked the Commission and the Department of Natural Resources (DNR) to investigate Integrated Gasification Combined-Cycle (IGCC) technology and its potential for the future energy needs of Wisconsin. The final IGCC report is due to be released during the fall of this year.

**Rates**

- Wisconsin has experienced rate pressure, but Wisconsin's average commercial and industrial rates are below the national average. Nearly 90 percent of the total Wisconsin rate increase in 2005 was due to fuel cost increases and power plant construction needed for system reliability.





## ELECTRIC DEMAND AND SUPPLY CONDITIONS IN WISCONSIN

An electricity provider is defined for SEA purposes as any entity that owns, operates, manages, or controls or who expects to own, operate, manage, or control electric generation greater than 5 megawatt (MW) in Wisconsin (see Figure 2-01). Electricity providers also include those entities providing retail electric service or who self-generate electricity for internal use with any excess sold to a public utility. Major retail electricity providers and/or transmission owners (TO) that submitted demand and supply data for this SEA include: American Transmission Company LLC (ATC), Madison Gas and Electric Company (MGE), Manitowoc Public Utility (MPU), Northern States Power—Wisconsin (NSPW) (d/b/a Xcel Energy, Inc. (Xcel)), Superior Water, Light and Power Company (SWL&P), Wisconsin Electric Power Company (WEPCO) (d/b/a We Energies), Wisconsin Power and Light Company (WP&L) (d/b/a Alliant), and Wisconsin Public Service Corporation (WPSC).

These major retail providers were required to include supply and demand data for any wholesale requirements that they have under contract. This action streamlined data reporting and reflected current market activities. Demand and supply data were also provided by Dairyland Power Cooperative (DPC) and Wisconsin Public Power, Inc. (WPPI) on behalf of their member cooperatives and municipal utilities. Comments were received by Citizen's Utility Board (CUB), Clean Wisconsin, RENEW Wisconsin, Wisconsin Industrial Energy Group (WIEG), Wisconsin Manufacturers and Commerce (WMC), Wisconsin Paper Council (WPC), Utility Workers Coalition, Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), Wisconsin Department of Transportation (DOT), and members of the public.

**Figure 2-01**      **Map of Major Electric Generation Plants in Wisconsin**



Table 2-01 shows the aggregated responses of the entities providing data for this SEA. The Commission requires providers to maintain 18 percent planning reserve margins. Data in Table 2-01 shows that through 2008 such standard is clearly met.<sup>1</sup> Data for later years should be considered preliminary, because of the longer outlook and the very nature of contracting for supply arrangements.

Table 2-01 Aggregated Responses of Entities Providing Data for this Final SEA

	2004	2005	2006	2007	2008	2009	2010	2011	2012	
	Historical Actual System Values		Est. Actual			Forecasted Planning Values				
Summer Peak Electric Demand (MW)										
Peak Load Data & Forecast (non-coincident)	13,001	14,395	15,166	15,686	16,069	16,412	16,754	17,075	17,263	
Direct Load Control Program	-40	-37	-93	-185	-192	-194	-196	-199	-201	
Interruptible Load	-265	-315	-399	-675	-679	-683	-683	-683	-683	
Capacity Sales Including Reserves	752	770	566	809	838	768	748	584	587	
Capacity Purchases Including Reserves	-715	-703	-645	-684	-611	-668	-645	-505	-506	
Miscellaneous Demand Factors	-584	-573	-573	-622	-628	-636	-635	-636	-636	
Adjusted Electric Demand	12,149	13,537	14,022	14,329	14,797	14,999	15,343	15,636	15,824	
Electric Power Supply (MW)										
Owned Generating Capacity, Used For Wisconsin Load	12,573	12,356	12,762	12,765	12,887	13,898	14,454	15,161	15,478	
Merchant Power Plant Capacity Under Contract, Used For Wisconsin Load	2,483	3,157	3,515	3,476	3,023	2,446	2,446	2,439	2,190	
Unit Retirements	0	-228	0	0	0	0	0	0	0	
New Owned or Leased Capacity Additions	0	664	60	60	952	615	765	386	310	
Capacity Changes at Existing Units	0	-8	17	-4	17	17	17	7	115	
Capacity Purchases Without Reserves, System Basis	795	633	105	144	94	94	94	94	94	
Capacity Purchases Without Reserves, Unit Basis	398	313	234	395	403	367	385	385	379	
Capacity Sales Without Reserves, System Basis	-111	-284	-33	0	0	0	0	0	0	
Capacity Sales Without Reserves, Unit Basis	-152	-119	-20	-139	-139	-139	-139	-139	-119	
Miscellaneous Supply Factors	-81	-66	-338	235	358	159	1	-10	125	
Electric Power Supply	15,905	16,418	16,302	16,932	17,595	17,457	18,023	18,323	18,572	
Reserve Data										
Reserve Margin	30.9%	21.3%	16.3%							
Planning Reserve Margin				18.2%	18.9%	16.4%	17.5%	17.2%	17.4%	
Additional Resources That Could Have Been Dispatched But Were Not (MW)										
Direct Load Control Program	153	188	126							
Interruptible Load	363	378	340							
Transmission Data - Firm Interface Capacity Counted for Reserves (MW)										
Resources Utilizing MINN-WUMS Interface	410	679	279	179	254	254	254	254	254	
Resources Utilizing CE-WUMS Interface	1,105	925	875	825	775	595	445	445	395	
Resources Utilizing Upper Michigan-Wisconsin Interface	475	475	475	475	475	475	475	475	475	
Total	1,990	2,079	1,629	1,479	1,504	1,324	1,174	1,174	1,124	

<sup>1</sup> This is the standard by which the Commission assesses electric supply adequacy for future years. That is, as the expected planning reserve margin approaches 18 percent in future years, the greater the likelihood of electric supply adequacy.

## Peak Demand and Supply

### Demand

The Commission compiled substantial information on peak electric demand and energy use. Demand is a measure of instantaneous use measured in MW. Energy is a measure of the volume of electricity used measured in MWh. Demand for electricity fluctuates throughout both the day and throughout the year. In any day there are peak hours of demand. In the summer the demand usually has one peak in the afternoon hours. In the winter it is common to have a morning and an evening peak. Over the course of a year demand for electricity is higher in the summer, lowest in the spring and autumn “shoulder” months, and a smaller peak occurs in the winter. Figure 2-02 and Table 2-02 show historic monthly peaks since 1997 and forecast monthly peaks through 2012.

Figure 2-02 Wisconsin Electricity Demand 1997-2012, Monthly Non-Coincident Peak, MW (Actual Data July 1997-2005; Estimated and Projected Data 2006-2012)

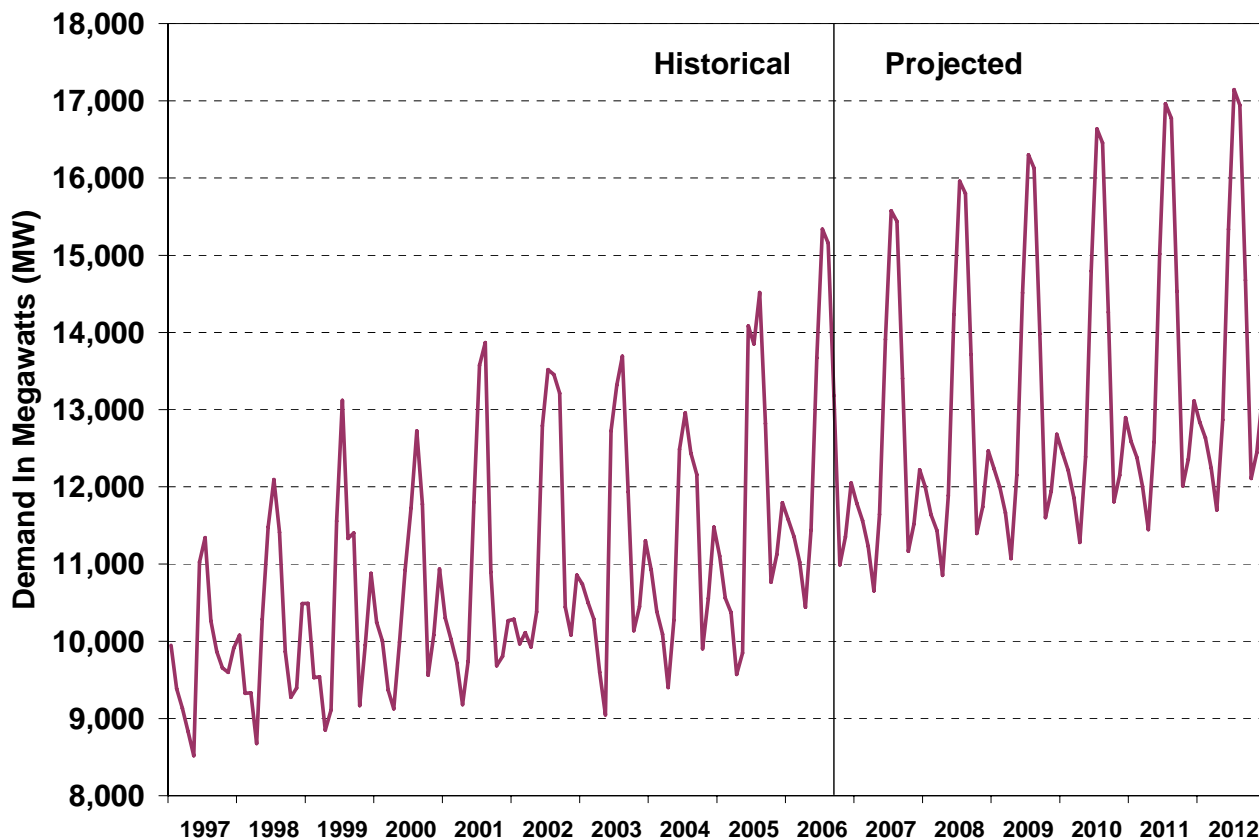


Table 2-02 Assessment of Electric Demand and Supply Conditions, Monthly Non-Coincident Peak Demands, MW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Historical (MW)</b>												
<b>1997</b>	9,948	9,386	9,132	8,833	8,518	11,025	11,343	10,265	9,866	9,657	9,598	9,912
<b>1998</b>	10,077	9,326	9,334	8,674	10,286	11,482	12,094	11,411	9,867	9,274	9,394	10,487
<b>1999</b>	10,492	9,531	9,540	8,850	9,108	11,554	13,120	11,331	11,402	9,167	9,953	10,881
<b>2000</b>	10,245	10,004	9,367	9,125	9,986	10,924	11,727	12,726	11,778	9,559	10,082	10,937
<b>2001</b>	10,300	10,032	9,722	9,179	9,742	11,800	13,575	13,870	10,898	9,684	9,805	10,268
<b>2002</b>	10,286	9,965	10,111	9,924	10,381	12,792	13,518	13,454	13,211	10,445	10,080	10,857
<b>2003</b>	10,739	10,498	10,291	9,602	9,048	12,725	13,319	13,694	11,937	10,136	10,450	11,302
<b>2004</b>	10,924	10,384	10,091	9,400	10,273	12,486	12,958	12,437	12,161	9,902	10,557	11,478
<b>2005</b>	11,127	10,678	10,433	9,610	10,000	14,020	13,832	14,323	13,224	11,912	10,833	11,581
<b>2006</b>	11,580	11,351	11,025	10,442	11,439	13,669	15,166					
<b>Forecasted (MW)</b>												
<b>2006</b>								15,158	13,180	10,989	11,353	12,051
<b>2007</b>	11,787	11,562	11,231	10,653	11,644	13,910	15,578	15,437	13,403	11,166	11,517	12,222
<b>2008</b>	11,998	11,638	11,435	10,854	11,887	14,232	15,961	15,799	13,714	11,395	11,742	12,467
<b>2009</b>	12,234	12,002	11,665	11,072	12,153	14,513	16,299	16,127	13,983	11,604	11,946	12,680
<b>2010</b>	12,440	12,217	11,860	11,280	12,391	14,795	16,639	16,456	14,262	11,806	12,150	12,898
<b>2011</b>	12,584	12,379	12,005	11,445	12,581	15,016	16,963	16,774	14,533	12,012	12,357	13,116
<b>2012</b>	12,841	12,634	12,241	11,700	12,867	15,335	17,144	16,944	14,678	12,110	12,442	13,199

Using projections provided by the entities submitting data for this SEA, this pattern of winter and summer peaks is expected to continue into the future. While actual demand will remain dependent upon weather, the overall trend is expected to show continued growth in peak demand, estimated to be approximately 2.35 percent per year through 2012.<sup>2</sup> This represents about 500 to 600 MWs, or roughly the generation from one major power plant, every two years.

### Summer 2006 Experience

July 2006 brought two significant hot spells to Wisconsin when temperatures exceeded 90° F for at least three days in a row. The first began July 15 and the second July 28. The latter heat wave was the strongest, recording six straight days of temperatures exceeding 90° F at the Milwaukee recording station. The hottest day during that period was July 31 when the temperature reached 102° F in La Crosse, 98° F in Milwaukee, and 94° F in Green Bay. That day also witnessed a record electricity demand peak for the entire state.

On July 31, 2006, total electricity demanded in Wisconsin on a non-coincident basis reached a record 15,166 MW. This is a preliminary estimate based on early information provided to the Commission in late August. The prior summer peak was

<sup>2</sup> The 2.35 percent annual value is the result of a log-linear regression using 2005 to 2012 summer peak month data only. The corresponding value for the historical period 2000 to 2006 in Table 2-02 shows 2.57 percent annual growth. Results for summer 2006 peak are preliminary and subject to change. Table 2-02 data is on a gross basis before the use of curtailable demands.

recorded in 2005. Growth between the 2005 summer peak and the record experienced in 2006 represented over 700 MW of new electricity demand in Wisconsin. Despite this large increase, all firm customers were served by their electricity provider. This was due to three factors: increasing amounts of instate generation; reliance on purchases and sales from the Midwest Independent Transmission System Operator (MISO) wholesale energy market; and the use of direct load control and interruptible load programs.

During this record peak electricity usage, several providers throughout the region required certain retail customers on direct load control and interruptible load tariffs to be curtailed. Here in Wisconsin a total of 492 MWs of electricity were curtailed by the state's retail electricity providers. Subtracting this value from the total peak of 15,166 MWs means that there was 14,674 MW of net demand on July 31, 2006, also a record. At the time of peak demand, the estimated *actual* reserve margin was a healthy 16.3 percent. This is a conservative estimate, as 466 MWs of additional direct load control and interruptible load were still available for dispatch.

Wisconsin was not alone in recording peak electricity demand during this period. Wisconsin electricity providers belong to MISO, a regional transmission grid operator. MISO reports that Midwestern electric demand hit a new record of 136,520 MW on an instantaneous basis at about 4 p.m. CDT on July 31. On that day, MISO also issued a maximum generation warning, a reliability requirement whereby all generators are to be prepared to offer their electricity generating units at maximum generation capability. On July 31, 2006, the MISO system indicated that day-ahead electricity prices in its wholesale energy market for August 1, 2006, would on average exceed \$200 per MWh for the 1 p.m. to 6 p.m. period. For a typical summer day without an extreme heat wave, the price per MWh would ordinarily be approximately \$80.

## **Programs to Control Peak Electric Demand**

The state's utilities have two forms of peak load management, direct load control and interruptible load. Peak load management is removing load from the system at times when utility resources for generation are not able to meet customer demand for energy. These programs were traditionally expected to be used primarily in the summer months, usually on very hot days when demand for electricity is at its highest. In recent years, under certain circumstances, when the winter peak demand for electricity outpaced available generation, these programs have been used to assure a balance between demand and available supply.

Direct load management gives the utilities the ability to take off the system electric demand such as residential air conditioners. When a utility implements direct load control, affected customers who volunteered to participate in the program receive a credit on their utility bill. The prior SEA and Table 2-01 show that direct load control has been used very sparingly from 2000 through 2006; between 14 and 93 MW of direct load control were called upon. As shown in Table 2-03, the MW of direct load control available to utilities is much greater than what was called upon.

The second form of load management is the use of interruptible load for industrial customers. An industrial customer choosing to select an interruptible load tariff receives a lower electric energy rate (cents per kilowatt hour) (kWh) by agreeing that load may be interrupted during periods of peak demand on the system. A utility will notify an industrial customer on an interruptible load tariff that its load will be taken off the system at a specific time. Again, the actual MW of load that are interrupted in a given year is less than the MW of load that are covered by interruptible tariffs. In any given year the need to utilize this form of load control will depend upon generation supply that is available on the days when peak demand happens. By 2012 interruptible load is expected to be 3.5 percent of projected electric power supply.

Table 2-03 Available Amounts of Programs and Tariffs to Control Peak Load, MW

	Direct Load Control (MW)	Interruptible Load (MW)
<b>Historical</b>		
1997	169	677
1998	162	794
1999	173	773
2000	169	664
2001	185	637
2002	200	583
2003	186	554
2004	193	628
2005	225	693
2006	219	739
<b>Forecasted</b>		
2007	185	675
2008	191	679
2009	194	683
2010	196	683
2011	199	683
2012	201	683

### Peak Supply Conditions: Generation and Transmission

2005 was a bellwether year for new generation and transmission in Wisconsin. As discussed in more detail below, over 1,300 MW of new generation capacity became commercially operational in Wisconsin in 2005. A new 345 kilovolt (kV) transmission line between the Wempletown substation in northern Illinois and the Paddock substation near Beloit became commercially operational in 2005 creating the first new high voltage interstate transmission connection into Wisconsin in several decades.

As noted in Table 2-01, the planned reserve margin for 2007 is expected to be 18.2 percent. Even with the rather robust growth in peak demand indicated by the utilities of approximately 2.35 percent per year through 2012, the significant additional



new generation coming online through 2010 is expected to keep planning reserve margins near or above 18 percent through 2012.

With the new generation coming online within Wisconsin, the amount of firm, ***contracted*** electric generation capacity to be imported through the Commonwealth Edison Company (CE) Wisconsin/Wisconsin Upper Michigan System (WUMS) transmission interface used for planning reserve margin calculations is expected to drop from slightly over 1,100 MW in 2004 to 395 MW by 2012.

## **New Generation**

Wisconsin is in a multi-year expansion period for electric generation that will expand in-state generation capacity by almost 5,000 MW through 2010 from about 14,000 MW in 2003. In 2004 the Riverside combined-cycle facility (600 MW) and the Kaukauna combustion turbine (CT) (55 MW) began commercial operation. In 2005 the Port Washington unit 2 combined-cycle (545 MW), the first side of the Fox Energy Center combined-cycle (310 MW), the West Campus Cogen facility (150 MW), and the Sheboygan Falls CT (300 MW) came online.

Over the next five years, through 2010, over 3,000 MW of additional, new generation is expected to be brought into service. These new facilities will include three new, large coal-fired units with over 1,700 MW of capacity, the first new, coal-fired baseload plants in Wisconsin since the early 1980s. Over 400 MW of new wind powered generation are expected to become part of the Wisconsin generation mix between 2006 and 2008. Over 500 MW of combined-cycle capacity is expected to be fired by natural gas along with a 55 MW boiler firing petroleum coke and a 100 MW generation addition from an upgrade of a nuclear powered plant.

The new generation, as noted above, will both reduce Wisconsin's reliance on the currently congested transmission grid connections to Illinois and will maintain a robust planning reserve margin through 2012.

## **Meeting Supply and Demand Needs**

Energy use continues to increase at approximately 2.35 percent per year. 2004 saw less of an increase in total electric sales primarily due to a cooler than normal summer. 2005 sales information indicates the warmer than normal summer resulted in sales levels above 2004. 2005 sales were also in line with average historical growth. 2006 information is not available. Energy sales are shown in the Figure 2-03.



Figure 2-03 Sales by Wisconsin Electric Utilities 1985-2005, GWh

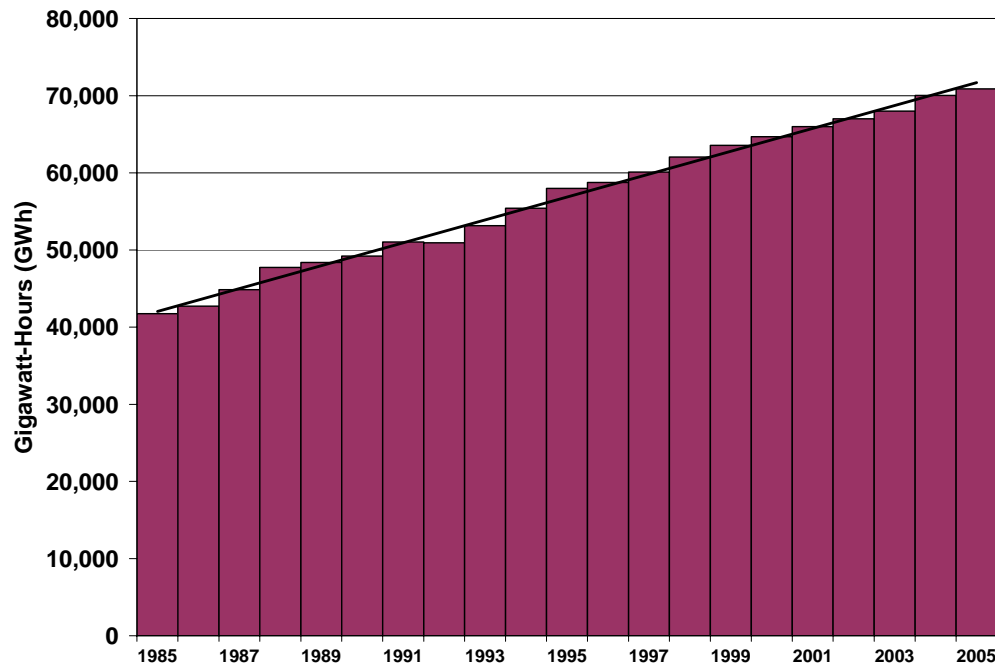
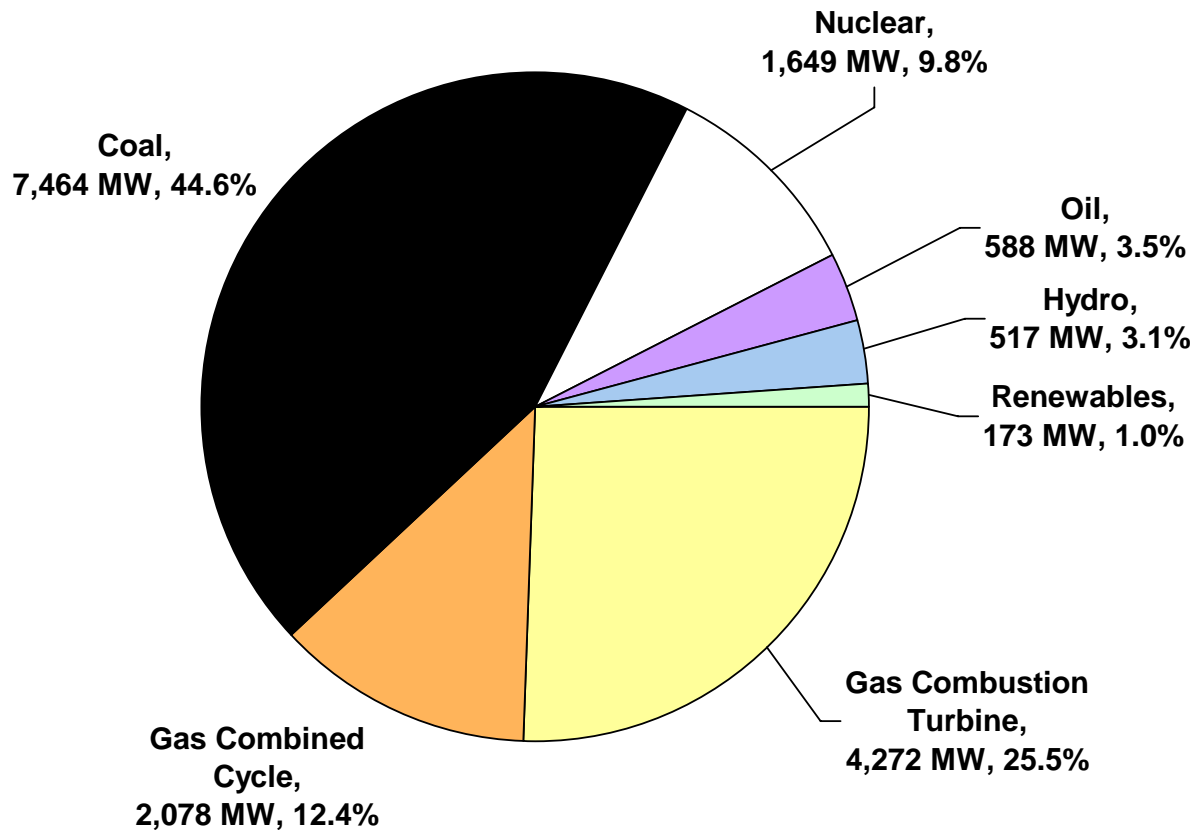


Figure 2-04 Estimated July 2006 Electric Generation Capacity by Fuel Type – Summer Rating, MW



Nearly 85 percent of the total generating capability within Wisconsin uses fossil fuel to produce electrical energy. Figure 2-04 shows the estimated MW capacity by fuel type for the summer of 2006.<sup>3</sup>

Figure 2-05 Actual Electric Generation by Fuel for 2005, MWh

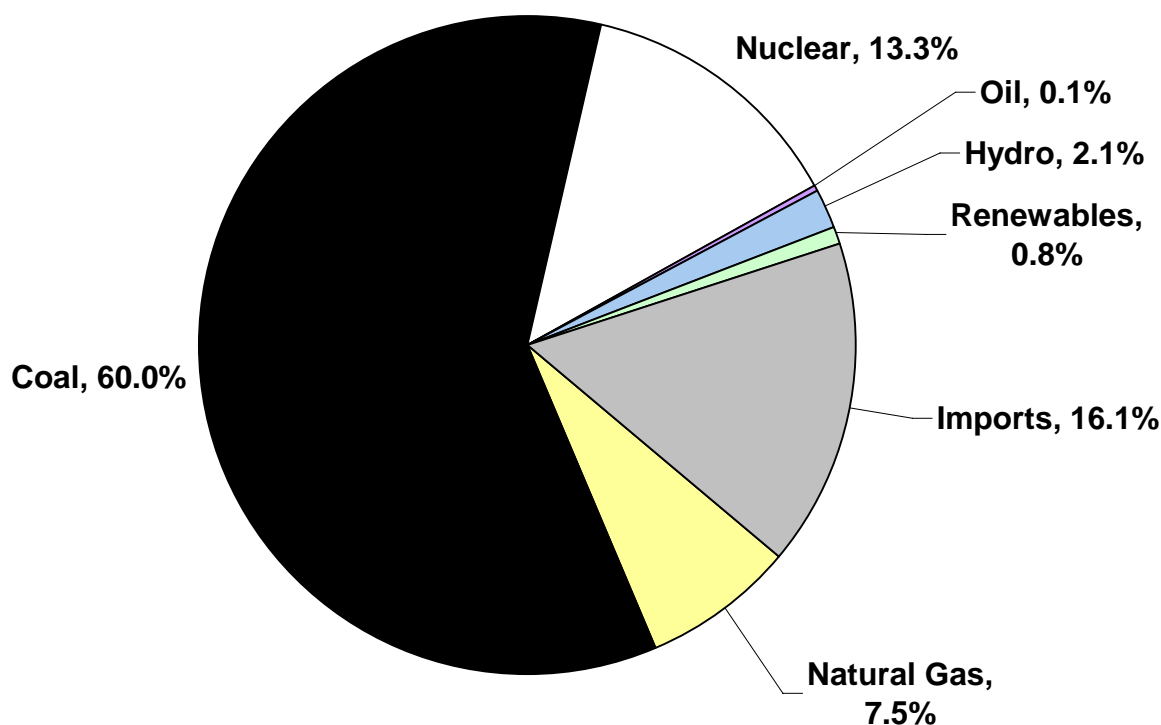


Figure 2-05 indicates the MWh of energy produced by fuel type for year 2005.<sup>4</sup> It shows that 73 percent of the energy consumed in Wisconsin came from either coal or nuclear generation.<sup>5</sup>

Figure 2-06 shows the fuel expenditures by type. This figure includes the price of fuel and the amount used to produce energy.

<sup>3</sup> Chart includes the Presque Isle Power Plant located in the Upper Peninsula of Michigan whereas the SEA 2002 Report did not include this plant. Northern States Power and WPPI generation located in Minnesota however is not included.

<sup>4</sup> Chart includes imported power and the output from the Presque Isle Power Plant is included in the coal percentages.

<sup>5</sup> 15 percent of energy is considered imports where the generation source is not defined.

Figure 2-06 Fuel Expenditures by Fuel Type Including Imports, 2005

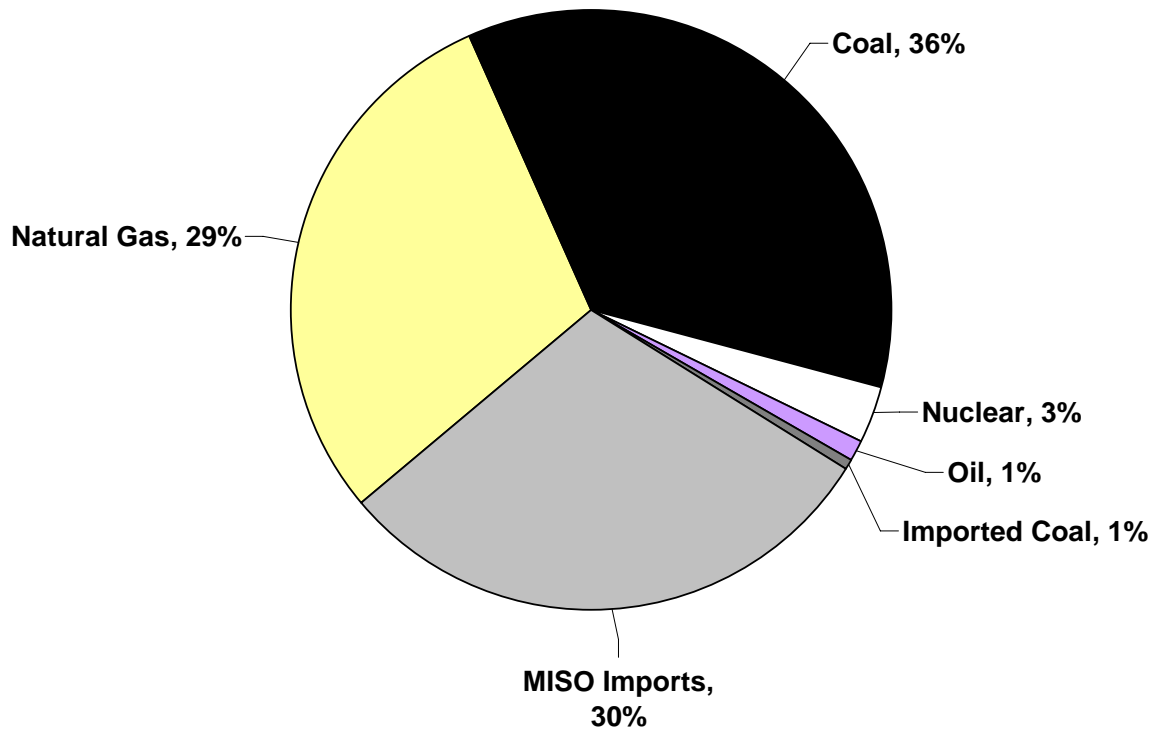
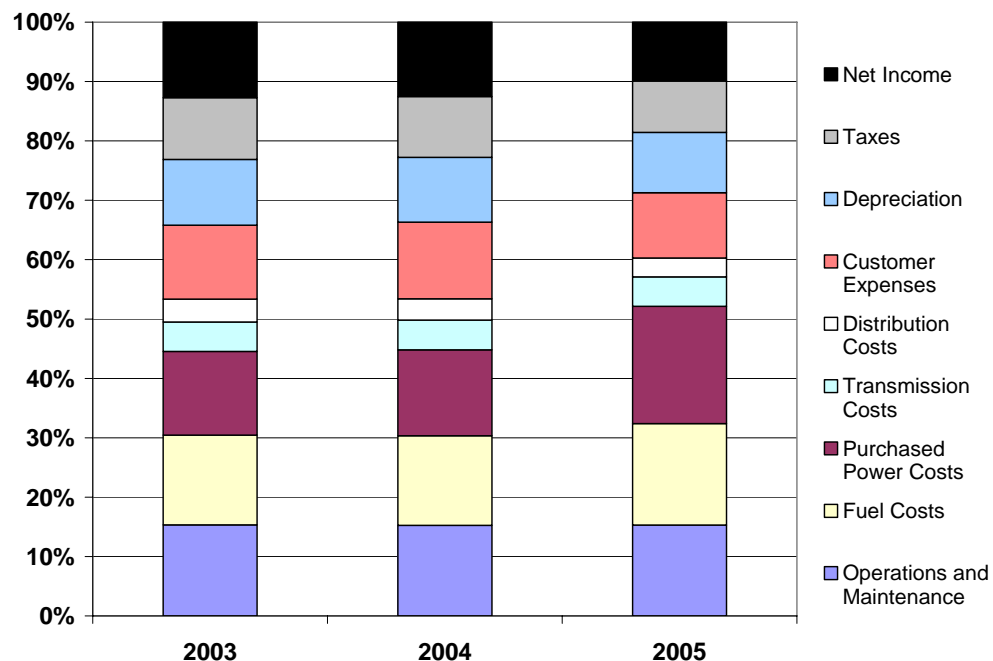


Figure 2-07 shows the breakdown of aggregated revenue requirements by type of cost. This figure shows the growing significance of purchased power and fuel costs.

Figure 2-07 Actual Components of Revenue Requirement, Wisconsin Electric Utilities\*



\* Large IOUs only.

Figure 2-08 shows the expected generation expansion plan for 2005 to 2014.

Figure 2-08 New Utility-Owned or Leased Generation Capacity, 2005-2014

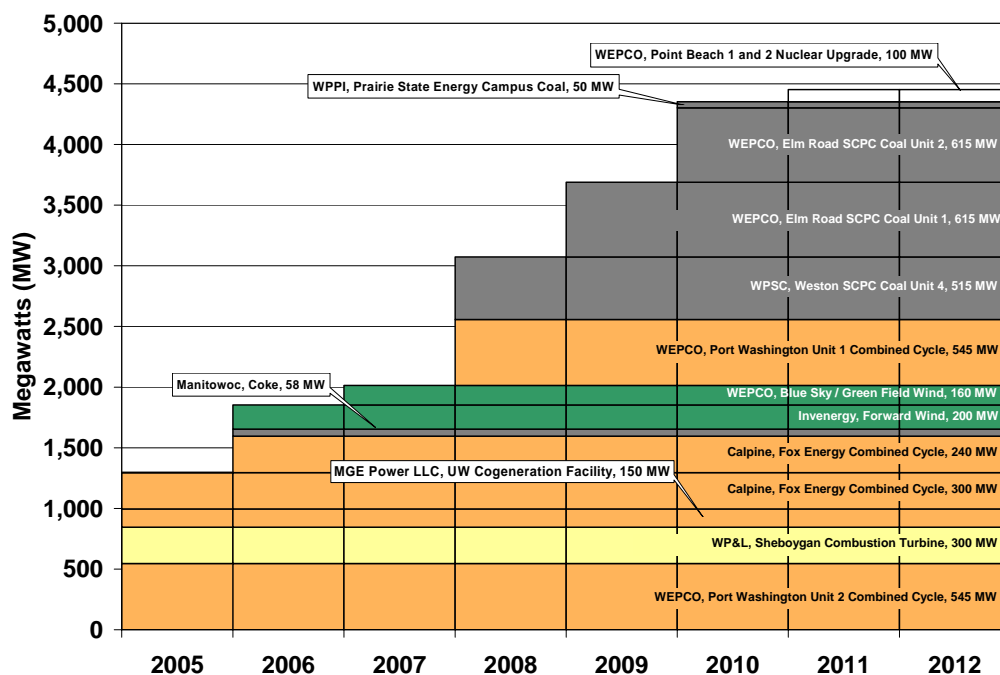


Figure 2-09 shows the comparative cost of generation options at various fuel prices. Coal units are priced using \$/mmBtu and gas prices are shown on a \$/Dth basis.

Figure 2-09 Production Costs, Assuming Different Fuel Prices

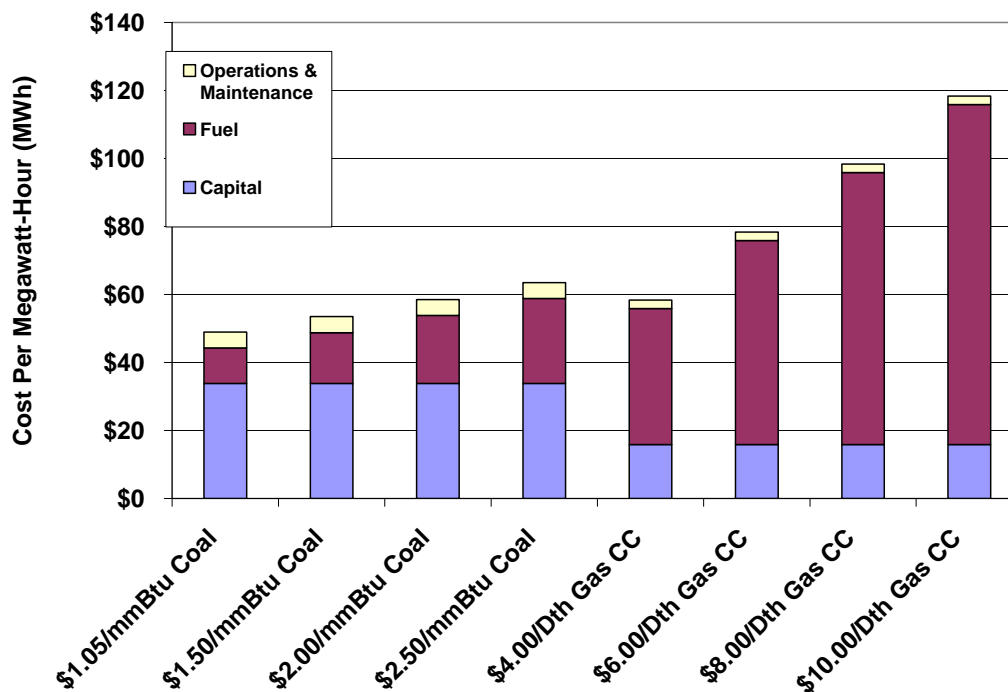


Table A-01 contains the list of generation projects in which there is some certainty to their online date for commercial operation. There are two additional projects where

uncertainty still exists. WP&L has announced a need for a baseload facility with a potential start date of 2012. Sites being examined include WP&L's preferred site at Nelson Dewey near Cassville<sup>6</sup> and an alternative site at Columbia near Portage. Likewise, WPSC is examining a potential baseload facility that may begin construction before 2012. Sites being examined include Weston in Marathon County and the Golden Sands project near Plover.

### **PSC and Electricity Providers Have Successfully Addressed Supply Adequacy**

One of the key reliability measures, but not the only one, is whether the state has adequate electric supply resources to meet its load obligations. An examination of expected planning reserve margins is one way to gauge whether this is the case. Since 1997, the Commission has required the state's utilities to plan for an expected reserve margin of 18 percent, meaning that anticipated supply resources should be at least 18 percent above expected load. Anticipated supply resources include existing generating units, those under construction with expected commercial in-service dates during the relevant SEA year, as well as signed purchased power or leasing agreements with independent power producers or utility affiliates.

Significant progress has been made by electricity providers in meeting the 18 percent planning reserve margin requirement. This is the case not just for the next year or two, but over the expanded time span of 2006 to 2012. Table 3-01 shows the projected planning reserves for the relevant years in all prior SEAs as well as for this final SEA. The major conclusion is that the state's providers are clearly meeting the expected 18 percent reserve margin requirement with ease, as compared to results in prior SEAs. This success is due to Commission approval of a significant supply construction program brought forth by the state's electricity providers. In essence, the probability that Wisconsin will have inadequate supply resources in the 2005-2012 timeframe is small. This is in contrast to the reliability crisis that occurred in the mid to late 1990s.

Table 3-01 Forecast Planning Reserve Margins from SEA

Planning Year	Final SEA2000	Final SEA2002	Final SEA2004	Final SEA2006
2001	17.95%			
2002	17.44%			
2003		19.07%		
2004		20.86%	18.30%	
2005			17.43%	
2006			14.97%	
2007			16.13%	18.20%
2008			12.80%	18.90%
2009			10.00%	16.40%
2010			11.00%	17.50%
2011				17.20%
2012				17.40%

Note: Shaded areas reflect either data was not available because the particular SEA did not cover those years or the fact that a forecast makes no sense for a historical year. The SEA was expanded to cover seven years of forecast data in 2004; prior SEAs only examined two years.

<sup>6</sup> An application for the proposed Nelson Dewey site was received by the Commission in February 2007.

## Trends in Generation Ownership

There have been several significant changes in generation ownership since the last SEA was published.

In the late 1990s and the first few years of this decade there was a major expansion in electric generation capacity brought about as IPPs built and brought into service natural gas-fired CTs and combined-cycle units. As natural gas prices climbed and nationwide peaking generation capacity was overbuilt, the profitability of these IPPs fell. Some IPPs such as Mirant and Pacific Gas and Electric Company sold their Wisconsin facilities and sites to affiliates of Wisconsin utilities. Other IPPs entered into multi-year contracts for at least some of their capacity with Wisconsin utilities. How the market for peaking capacity evolves is an area of interest well beyond Wisconsin. Efforts to create markets for capacity by regional transmission organizations have not gone smoothly. The Commission continues to monitor this evolving issue.

One area where IPPs have been active is in the development of wind generation projects.<sup>7</sup> IPPs have been active in developing wind projects in Wisconsin and throughout the nation. Even here, though, the financial difficulties facing IPPs have led to collaborative efforts with utilities to find a market for electricity generated by wind.

Another area of significant change in the ownership of electric generation in Wisconsin occurred in early 2005 when the Commission approved the sale of the Kewaunee Nuclear Power Plant to Dominion Energy Kewaunee (DEK), a subsidiary of Dominion. This marks the first time that a large, baseload electric generation facility in Wisconsin is owned by a company that is not a Wisconsin utility or a Wisconsin utility holding company. This follows a trend in the nuclear generation sector where a handful of companies specializing in the ownership and operation of multiple nuclear power plants sell the electricity, usually under contract, to the former utility owners of the plants.

## TRANSMISSION SYSTEM PLANS, ISSUES, AND DEVELOPMENTS

### Midwest Independent Transmission System Operator (MISO)

A new feature of electric supply and demand in Wisconsin is MISO and the MISO Day 2 Market. The MISO Day 2 Market began on April 1, 2005. Under Day 2, MISO centrally dispatches generation using the real-time availability of generation and transmission resources. MISO is a result of the Federal Energy Regulatory Commission's (FERC) orders to create a robust, interstate wholesale market for electricity in the hope that a more efficient use of generation and transmission resources will reduce wholesale electricity prices.

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<sup>7</sup> At the present time, the Commission has no application from IPPs before it for the construction of combustion turbines, combined-cycle units, or coal-fired facilities. Whether this will change in the future is unknown.

The experience under MISO Day 2 has not been fully evaluated. The market is new and the learning curve of both MISO and the MISO participants is long and complex. In some respects MISO has made transactions for wholesale electric purchases more transparent and it appears that the MISO centralized dispatch may be making better use of the existing generation and transmission resources throughout the Midwest. Issues regarding the ability of MISO to facilitate transactions across the area covered by the MISO dispatch and transmission territory, and areas such as northern Illinois that are in a territory covered by another regional transmission organization (CE opted to join PJM Interconnection (PJM)), continue to be a concern to both Wisconsin utilities and to the Commission. Costs to operate MISO remain a concern as well. The Commission continues to monitor the costs and benefits of MISO. Several stakeholders including CUB, WIEG, WMC, and WPSC expressed the hope that the Commission vigorously pursue efforts by MISO and FERC to ensure that Wisconsin ratepayers are receiving net benefits from MISO reliability operators and its wholesale energy market.

## **Existing Transmission System**

Western and eastern parts of Wisconsin are each served by a well-connected high voltage electrical network. However, there are few connections between these two geographical areas of the state. The three companies with transmission systems serving Wisconsin are ATC, Xcel, and DPC. Wisconsin's existing high voltage electric transmission system is shown in Figure 3-01.

Of the top 24 flow gates with constraints from 2001 through 2004 in the MISO footprint, Wisconsin, along with the Upper Peninsula, has 12 of them. Twenty-one of the twenty-four have planned solutions by between 2005 and 2009. The last three flow gates (in Iowa) will not be significantly constrained in 2009. For example, MISO's Number 8 ranked Flow Gate constraint is the Lore-Turkey River 161 kV line assuming the loss of the Wempleton-Paddock 345 kV line. The ultimate, proposed solution is a new 345 kV line from Wisconsin to Iowa or Illinois in 2014.

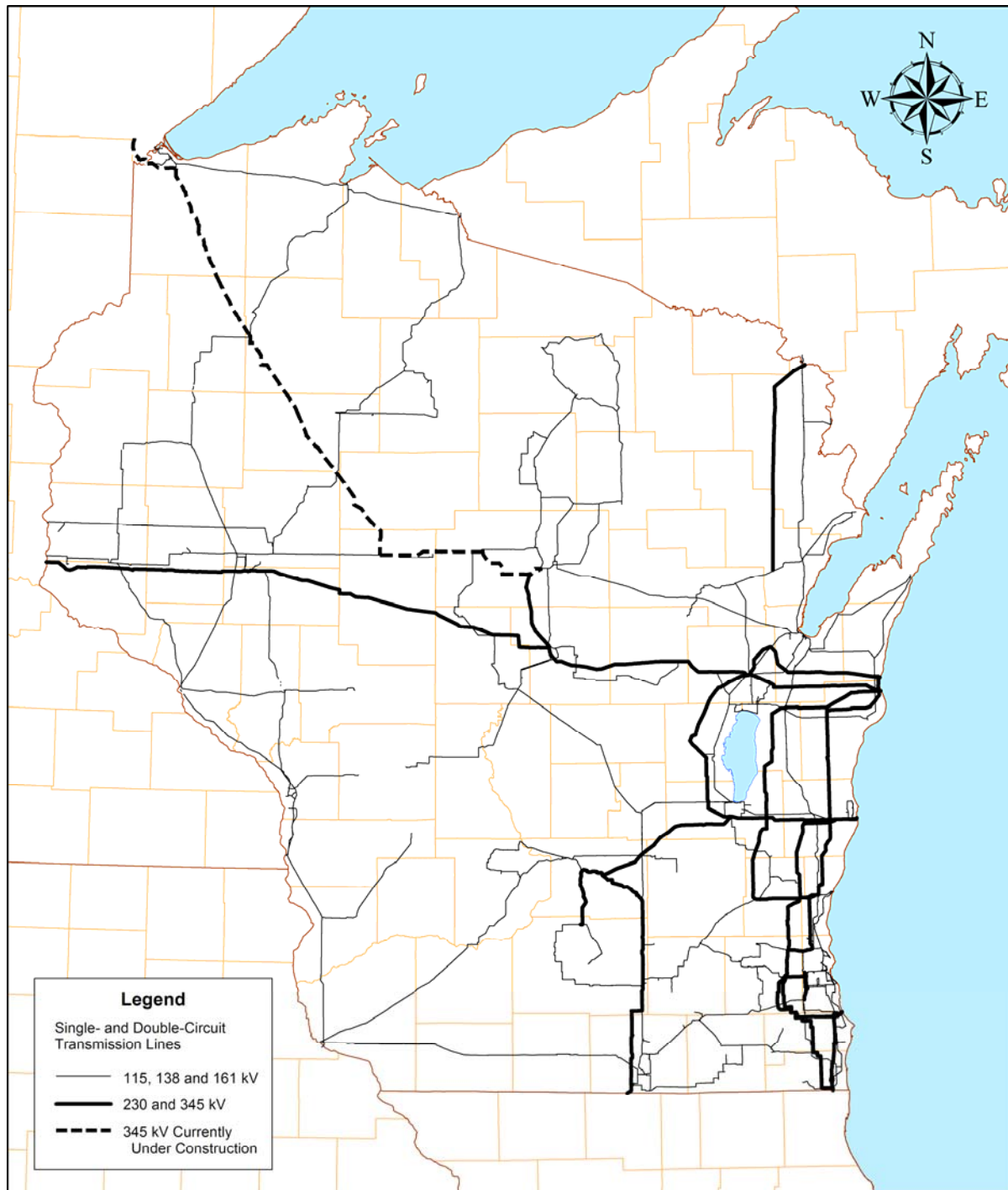
## **Transmission Planning**

Transmission planning is a constant iterative process of determining local needs, while simultaneously determining the long range development of the Extra High Voltage (EHV) system to accommodate the cumulative load and generation requirements. Some of the major planning factors include:

- Load growth
- New interconnections (load and generators)
- System performance and reliability
- Infrastructure repair and replacement
- Transmission service requests
- Transaction or congestion limitations
- Regional system support

ATC, Xcel and many other Midwest transmission owners belong to MISO, which began operations in 2001. These organizations all do various forms of transmission planning. Results of ATC and Xcel's analysis follow. MISO's approach is explained separately below. MISO is one of the Regional Transmission Organizations (RTO) that was created pursuant to FERC orders governing operation of the nation's interconnected transmission systems.

Figure 3-01 Existing Wisconsin High-Voltage Transmission System





## Locations and Descriptions of Proposed Transmission Projects in Wisconsin

By state statute, this SEA is to report all transmission lines designed to operate at voltages above 100 kV on which transmission providers propose to begin construction before 2012, subject to Commission approval. “Construction” means building new lines, rebuilding existing lines, or upgrading existing lines. Building new lines requires new transmission structures and, likely, requires new ROW. Rebuilding or upgrading existing lines may also require new structures or new ROW.

To rebuild a line means to modify or replace an existing line; in other words, to keep it at the same voltage and improve its capacity to carry power through new hardware or design. To upgrade an electric line means to modify or replace an existing line, but at a higher voltage. An upgrade also improves the line’s capacity to carry power. Both rebuilding and upgrading may require some (or many) new, taller structures. New ROW may also be needed if the new structures require a wider ROW, or if the line route requires relocation to reduce environmental impacts. Either way, rebuilt or upgraded transmission lines usually need significantly less new ROW than new lines.

The primary reasons for needing additional transmission lines may include one or more of the following:

- Growth in an area’s electricity use, which often requires new distribution substations and new lines to connect them to the existing transmission system, or needed increased capacity of existing transmission lines;
- Aging of existing facilities that has resulted in reduced reliability due to poor condition;
- Maintenance of system operational security for the loss of any one transmission or generation element;
- Increased power transfer capability or access;<sup>8</sup>
- Generation interconnection agreements and transmission service requirements for proposed (or approved) new power plants.

In general, the higher a line’s voltage, the more power it can carry. As a consequence, the higher-voltage transmission lines are important in delivering large amounts of power on a regional basis, and the lower-voltage lines primarily deliver power over a more limited area. The ability to deliver power reliably to local substations and the ability to import power from, or export to, other regions, are both important functions in providing adequate, reliable service to customers.

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<sup>8</sup> With respect to projects for access purposes, ATC continues to examine the issue. In comments, WPSC supported several new access projects, as did other commenters.

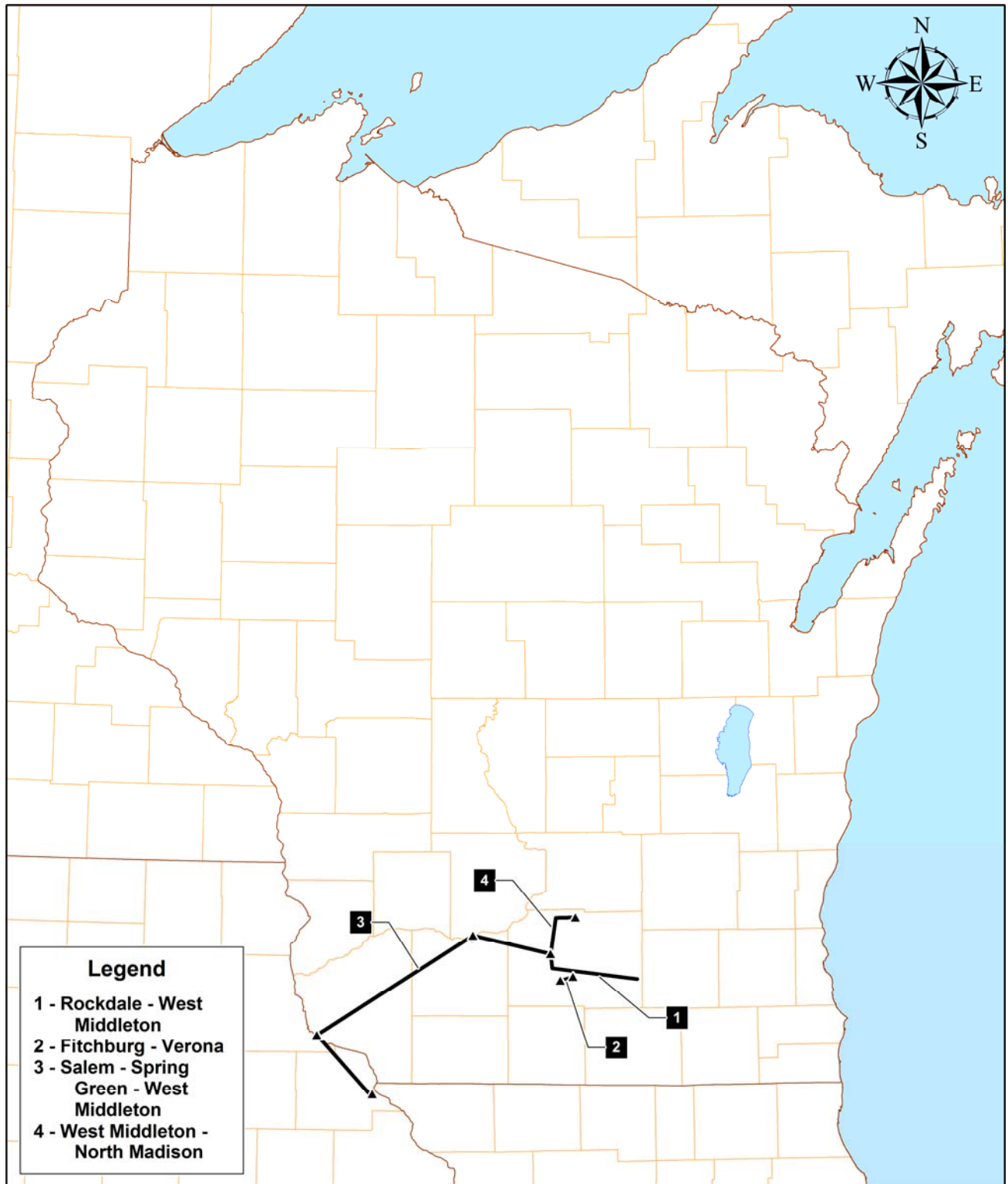
Table A-02 lists the high-voltage transmission and upgrades/rebuilds of lines designed greater than 100 kV, upon which utilities expect to begin construction prior to 2013.

The transmission owners that provided transmission project information include ATC, DPC, and Xcel.

Table A-03 lists proposed high-voltage transmission projects involving new ROW. These listed projects are those that met the required criteria at the time of data collection. Projects with Certificate of Public Convenience and Necessity (CPCN) applications already filed with the Commission are not listed in Table A-03.

While not listed in Figure 3-02, it should be noted that ATC is presently investigating the need for a 345 kV transmission line known as Paddock-Rockdale. The Paddock-Rockdale line is not shown in Figure 3-02 because as presently understood, it would be unlikely to use significant new ROW. In its SEA filing, ATC suggested the use of the Salem-Spring Green-West Middleton project as an access line proxy.

Figure 3-02 Proposed High-Voltage Transmission Line Additions Involving New Rights-of-Way, Excluding Projects with CPCN Applications Already Filed with the Commission



## Regional Developments

### MISO Market

As previously stated, MISO began its Day 2 and Real-Time Markets on April 1, 2005. The months since April 2005 have seen a different pattern of dispatch than in the past. Some market participants report increased transmission access and others report costs that seem higher than past experience. There have been several cost benefit studies with a range of benefits being expressed. One of the most recent studies by the consulting firm ICF Resources, LLC (ICF) claims to show about a 5 percent improvement in production cost efficiencies.<sup>9</sup> A similar study for PJM had a similar range of benefit. MISO claims a higher benefit for Wisconsin. These studies are complex with forward and back casting simulations with different business rules. The Commission views all estimates as preliminary at this time and in need of full scrutiny. It is not certain if the analysis includes MISO operating costs. A recent study conducted by ICF indicates the MISO Day 2 operation produces \$220 million to \$385 million of regional energy production cost savings each year. One of the continuing debates is the allocation of costs. Many costs are now spread across the footprint of MISO members with the assumption that, in total, all load serving entities will benefit collectively. Some parties disagree on the amount of their allocated cost assessments as those types of operational costs were not incurred before the market started.

### MISO Transmission Expansion Plan 2005 (MTEP05)

The MTEP05 was issued in June 2005. It analyzes 15 states in the upper Midwest from the Dakotas to Kentucky and covers approximately 146,000 MW of generation and 97,000 miles of transmission. Pennsylvania-based PJM is an RTO adjacent to, and also inter-mingled with, MISO. For both MISO and PJM, FERC required a joint and common market be developed for the two RTOs when FERC allowed CE to join PJM.<sup>10</sup> The area covered by the MTEP05 is shown in Figure 3-04. Note there are several seam issues with non-RTOs and other non-MISO members.

The MTEP05 covers the planning years through 2009 as approved in June 2005. MISO developed the MTEP05 to ensure the reliability of the transmission system that is under its operational and planning control. The plan also identifies critically needed expansion to support a competitive supply of electricity. The plan considers all market perspectives, including demand-side options, generation locations, and transmission expansions.

Some of the key findings from the MTEP05 are:

- The transmission owners have 615 planned or proposed projects totaling approximately \$2.91 billion, primarily to maintain reliability.

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<sup>9</sup> ICF is presently performing another study for MISO, with results due later in 2006.

<sup>10</sup> The creation of a joint and common market between MISO and PJM is an issue of ongoing concern which the Commission is following.

- Of the top 24 flow gates with constraints, 21 have planned solutions by 2009. Three lines in Iowa will not be significantly constrained in 2009.
- MISO has conducted additional sub-regional system reliability assessments including load deliverability and operational concerns.
- Transmission expansion exploratory studies in the upper Midwest are continuing to determine the most efficient set of EHV ( $\Rightarrow$  230 kV) transmission lines for delivery of energy from clusters of wind and coal generation west of Wisconsin to the market.

### **MISO Transmission Expansion Plan 2006 (MTEP06)**

The MTEP06 process began in the summer of 2005. It was issued by MISO stakeholders in February 2007. The MTEP06 includes more objectives and comprehensive analysis than the MTEP05. Some of the *newer* objectives include:

- Coordinate transmission plans with neighboring RTOs and non-RTOs.
- Identify and recommend transmission system upgrades for more efficient operation of the energy market.
- Seek the development of an optimized transmission plan by:<sup>11</sup>
  - Reviewing TOs' submitted plans and eliminating duplicative transmission plans.
  - Identifying potential non-transmission solutions (to reliability issues) such as demand reductions or new generation additions, where such potential solutions are appropriate.
- Provide information relative to expectations of Financial Transmission Rights (FTR) coverage under the proposed regional plan.

The MTEP06 assumes significant activity in the 2006 and 2011 model years with the planned and proposed transmission projects, and with the known generation interconnection studies. The types of analysis that will be performed in the MTEP06 include:

- Steady State Analysis, including NERC Categories A, B, C and D
- Dynamic Stability Simulations
- Voltage Stability and Reactive Supply Analysis
- Load Deliverability Analysis
- Small-Signal Analysis
- Transfer Analysis

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<sup>11</sup> As part of docket 137-EI-100, the Access Study Initiative docket, MISO indicated it may propose an optimal solution as part of MTEP07.

There will be additional evaluation of the comparative project investment costs and the costs of alternative non-transmission solutions that would also resolve the identified reliability issues. Some of the alternative solutions could include re-dispatch, effectiveness of demand side concepts, or new generation siting options.

The identification of opportunities for more efficient dispatch will occur with checks of all the significant constraints. MISO will then compare the market participants' lowest cost potential solutions (*i.e.* transmission, demand response, generation) to the to highest cost constraints and determine a reasonable price cutoff for consideration.

MISO will also identify large scale, economically or regionally beneficial projects. MISO has a proposal to calculate and estimate the net economic benefits of economic upgrade projects. The calculation calls for the annual economic benefits to be estimated for each year for a ten-year period from the proposed in-service year. The present value of the levelized annual fixed charges associated with the revenue requirements for the projects will be determined using the discount rate applicable to the funding entity. The same discount rate will be used to determine the present value of the economic benefits.

Besides continuing to study other upper mid-west exploratory projects, MISO will address the Southern Illinois/Southern Indiana/Kentucky/TVA in one study. Another new exploratory project is titled the "MISO Vision Project." This project has three aspects:

1. Move 10,000 to 20,000 MW associated with new wind and coal from the western side of MISO to the eastern side of MISO.
2. Investigate the use of channeled transmission to avoid overhead line issues.
3. Incorporate U.S. Department of Energy (DOE)/Homeland Security/Department of Transportation (DOT) into the process.

### **ATC Access Study Initiative**

ATC began an Access Study Initiative in 2004. The process includes obtaining customer and stakeholder input on the potential benefits, costs, and impacts of improving access. Some of the issues include: chronic transmission limits, economic losses, reliability, strategic operating flexibility, construction costs, and societal impacts (including environmental). The Commission opened docket 137-EI-100 to investigate and gather information to help determine a policy framework for good planning practices. The Commission issued a report and closed the docket in March 2006. This docket is explained more fully in the Challenges section of this report.

### **Reliability Council Changes**

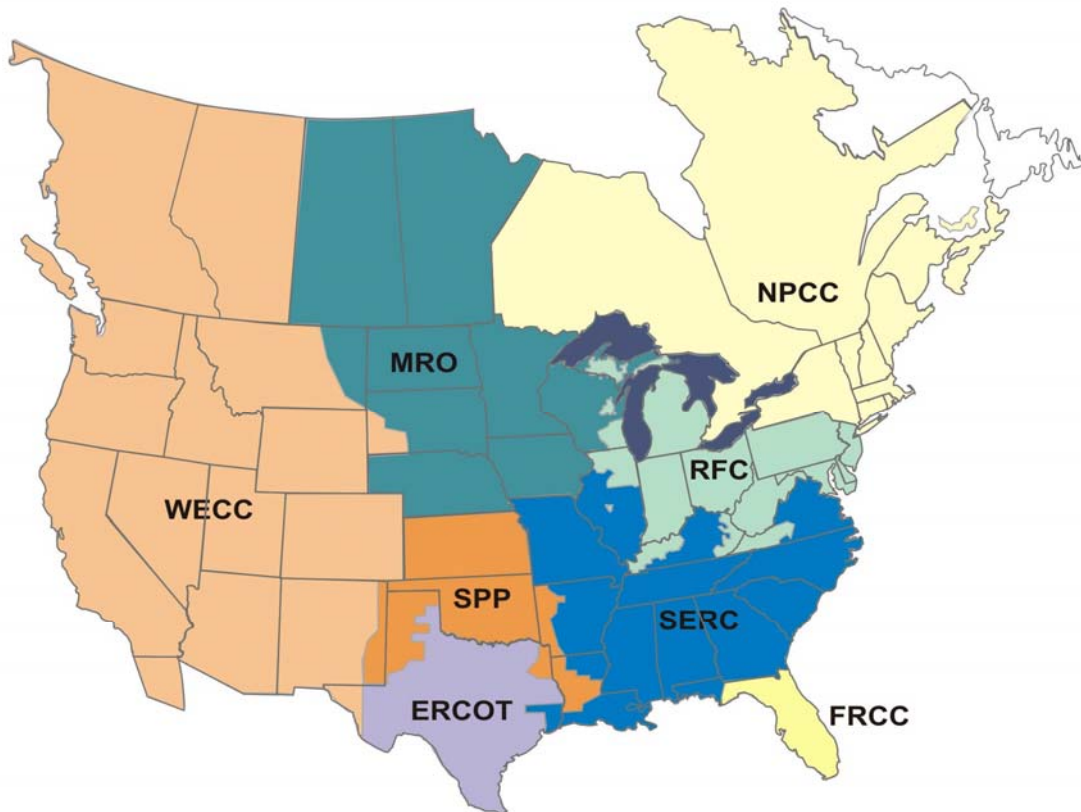
The electrical power system in Wisconsin has operated under the oversight of two regional reliability councils of NERC. NERC is a not-for-profit company formed by the electric utility industry in 1968, following the 1965 New York electric system blackout,

in order to promote the reliability of the electricity supply in North America through the voluntary use of common planning and operating guidelines. For many years the Mid-Continent Area Power Pool (MAPP) regional reliability council oversaw the northwest and western part of Wisconsin composed of the Xcel and DPC control areas.<sup>12</sup> MAPP also covered Minnesota, Iowa, Nebraska, the Dakotas, and parts of the Canadian provinces of Manitoba and Saskatchewan. That council was changed to the Midwest Reliability Organization (MRO) in 2005.

The Mid-America Interconnected Network (MAIN) regional reliability council oversaw the remainder of the state in which transmission service is now provided by ATC. MAIN also covered Illinois and parts of Missouri, Iowa, southern Minnesota, and the Upper Peninsula of Michigan. Control areas inside ATC's Wisconsin footprint are operated by WP&L (Alliant), MGE, WEPCO, and WPSC. MAIN dissolved at the end of 2005 with the members joining new reliability organizations.

WEPCO joined the Reliability *First* Corporation (RFC). RFC is the successor organization to three existing NERC councils: MAIN, ECAR and MAAC. WPSC, MGE and Alliant will join MRO. RFC began operations January 1, 2006. ATC has joined both MRO and RFC. Some of the Missouri and Illinois members will be joining the Southeast Reliability Council (SERC). See Figure 3-03, NERC Reliability Councils 2006.

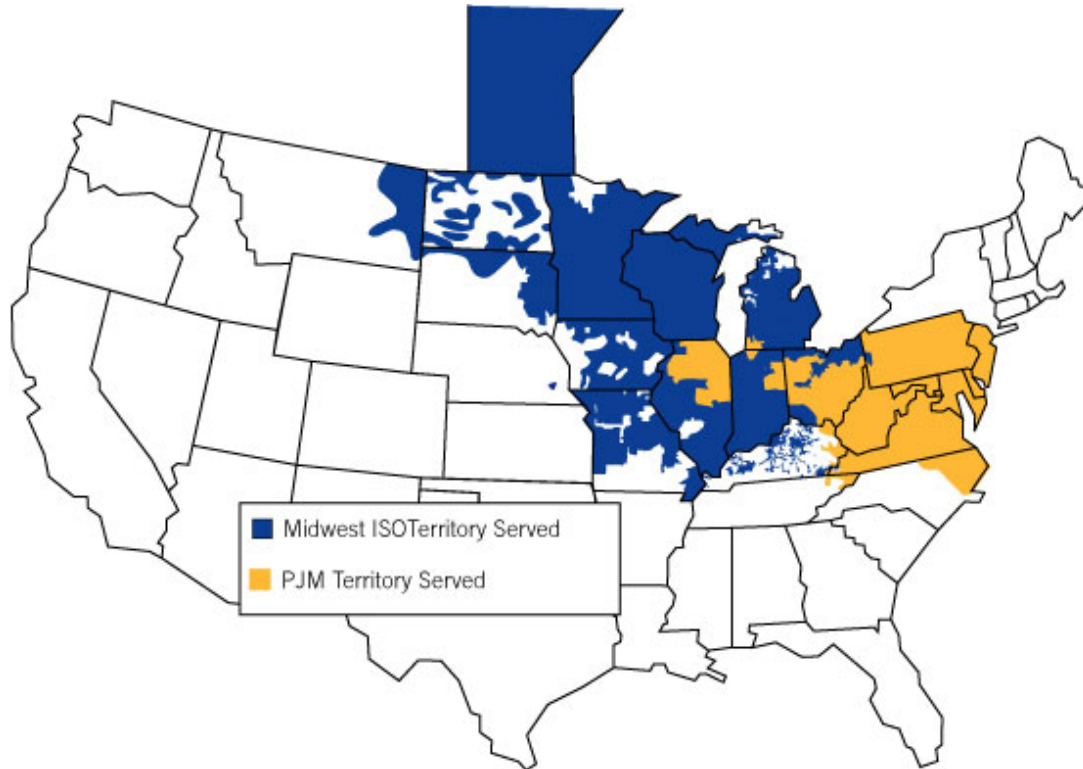
Figure 3-03 NERC Reliability Councils 2006



<sup>12</sup> A control area is a portion of the electrical system where generation is controlled to meet electrical demand (load) within that area.



Figure 3-04 Detailed MISO and PJM Regional Transmission Organization Areas



## RELIABILITY ASSESSMENT

Wis. Stat. § 196.491(2)(a) specifically requires the SEA to assess: (1) the extent to which the regional bulk power market is contributing to the adequacy and reliability of the state's electrical supply; (2) the adequacy and reliability of purchased generation capacity and energy to serve the needs of the public; (3) the extent to which effective competition is contributing to a reliable, low-cost, and environmentally sound source of electricity for the public; and (4) whether sufficient electric capacity and energy will be available to the public at a reasonable price.

The analysis that follows incorporates data submitted by the electricity providers in their SEA submissions, other data collected by Commission staff, as well as the electricity providers' own qualitative discussions of the above important questions.

### **Assessment of the Extent to which the Regional Bulk Power Market is Contributing to the Adequacy and Reliability of the State's Electric Supply**

New utility-owned generation and a new real-time energy market are the significant changes that have occurred since the last SEA. As new generation capacity continues to be brought into service the amount of capacity purchases from IPPs is expected to drop significantly through 2012. As can be seen in Table 2-01, capacity purchases made on a system basis are expected to drop from 795 MW in 2004 to 94 MW in 2012. Yet, reliability is expected to remain robust with a 2012 planning reserve margin of 17.4 percent, seven years into the future.



Also shown in Table 2-01 is a reduction in the MW of capacity under contract from merchant power plants. Merchant power plant capacity under contract is expected to fall from 3,515 MW in 2006 to 2,190 MW in 2012. This decrease occurs even while counting the sale of the Kewaunee Nuclear Power Plant and the associated power purchase agreement by the former utility owners for the capacity and energy from that facility through its current license.

Planning reserve margins have been a major concern in earlier SEAs. In the second half of the 1990s actual reserve margins fell to less than 10 percent four out of five years. The lowest actual reserve margin fell to 6.7 percent in 1995. By contrast, the actual reserve margin in 2005 was 21.3 percent. Preliminary calculations for 2006 result in 16.3 percent reserve margin.<sup>13</sup>

Sufficient generation capacity is not the Commission's only concern. Getting the power from the generation source to the load is a concern as well. Wisconsin's current transmission system has numerous constraints that limit the flow of electricity into and within the state. These numerous constraints led MISO to name the WUMS area of Wisconsin and Michigan as a narrowly constrained transmission area. For the next five years there are special protections available to Wisconsin and Michigan to avoid undue prices on electricity in the wholesale market. It is expected that the current and ongoing transmission system expansion and improvements will greatly improve the ability to move electricity into and within Wisconsin by 2010 when the special protections will be withdrawn.<sup>14</sup>

Even with existing constraints due to current transmission limitations, the MISO market has begun to transform the way the bulk market for electricity operates. Numerous responses to the Commission's topical question about MISO noted that there is much more transparency in the market for electricity; that is, price and availability are more visible and apparent to market participants on a day ahead and real-time basis compared to the past. At the same time, bilateral contracts for electricity are becoming much less common. As an analogy, the market for electricity is moving from a real estate type market where each transaction is unique to a commodity-type market, such as the market for oil, where current supply and demand from many players set the price. The expectation that led to the establishment of regional transmission organizations, such as MISO, and the use of real-time geographically specific pricing known as locational marginal pricing (LMP) was that these markets and organizations would lead to more efficient generation and dispatch choices, and lower the wholesale price of electricity. MISO believes that implementation of its wholesale energy market has improved transmission operations and capabilities.

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<sup>13</sup> In reality, the actual reserve margin is in some sense larger than these values because some direct load control and interruptible load could still have been called on.

<sup>14</sup> Certain commenters at the public hearing noted this was a serious concern since present locational marginal pricing (LMPs) in WUMS are higher than in other MISO areas.

## **Assessment of the Adequacy and Reliability of Purchased Generation Capacity and Energy to Serve the Needs of the Public**

Purchased generation capacity and energy may be from facilities located within Wisconsin or from facilities located outside of Wisconsin. For this analysis, NSPW and SWL&P will be considered separately. These two utilities have Minnesota-based affiliates where much of their generation capacity and energy needs are met as though they were part of the affiliates' system. The Wisconsin utilities in the eastern portion of the state are not part of multi-state affiliate networks that dispatch electricity across multiple states as a system. These WUMS utilities were well placed in the late 1980s and throughout the 1990s to make purchases of excess generation capacity and energy, especially in Illinois. Thus, much of past SEA discussions on purchased generation capacity and energy focused on imports of generation capacity and energy.

As the transmission system and especially the transmission connections between Wisconsin and Illinois became constrained, the ability to purchase capacity in other states for Wisconsin, or to purchase energy generated in other states to be delivered to Wisconsin, became problematic.

Again, three things have changed in recent years with respect to purchased generation capacity and energy. First, several new facilities owned by independent power producers have initiated commercial operation in Wisconsin. Second, the aforementioned sale of the Kewaunee Nuclear Power Plant to DEK has broadened the market to include baseload generation in addition to the CT and combined-cycle generation that has a much lower capacity factor. The CT market is usually a market that focuses on generation capacity that is only expected to be used approximately 5 to 10 percent of the time. Combined-cycle units have higher capacity costs but are much more efficient. For the higher capacity costs, but lower generation costs, these plants are expected to be used from between 25 percent of the time to perhaps even more than 70 percent of the time, depending upon fuel costs. A nuclear powered baseload plant has very high capacity costs, but very low cost of generation, not including externality costs.<sup>15</sup> For a nuclear power plant, and to a lesser extent a large coal-fired baseload plant, to be commercially viable, they need to be used much more and have utilized capacity factors of 80 percent to even greater than 90 percent. Third, as mentioned elsewhere in this report, MISO operates a wholesale energy market. Comparing the market for purchased generation capacity in 2000 to the same market in 2006-2007 indicates that more of the purchased generation capacity and energy will be from facilities located within Wisconsin.

The market for purchased generation capacity and energy continues to evolve. The business failure of Enron and deep concerns about the economics of the market for generation capacity for peaking needs has affected electricity markets well beyond Wisconsin. The Commission continues to monitor developments at MISO in how generation capacity markets continue to develop. At the same time, the Commission

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<sup>15</sup> This does not mean other generating plants do not have externality costs. In comments, WIEG, WMC and WPC support repeal of the Wisconsin moratorium on new nuclear units. Due to global warming considerations, WPPI suggested stakeholders keep an "open mind" about potential new nuclear units as well. Some members of the public supported new nuclear units as well.

found in the proceeding approving the sale of Kewaunee that concerns, including reliability concerns, can be overcome to allow the sale of a rate base baseload plant with a power purchase agreement that protects Wisconsin ratepayer interests.

### **Assessment of the Extent to which Effective Competition is Contributing to a Reliable, Low Cost, and Environmentally Sound Source of Electricity for the Public**

FERC has the authority under federal law to regulate the market for wholesale power. As part of FERC's regulatory agenda, it established rules for regional transmission authorities and allows those regional transmission authorities to establish markets for energy. This has culminated in the Day 2 Market under MISO that sets day ahead and real-time prices for energy at a location-by-location basis throughout the area served by utilities participating in MISO. Most of the major Wisconsin electric utilities are part of MISO.

The MISO market makes the analysis in this section less clear cut than in past SEAs. The market for electricity now has MISO establishing prices based on congestion costs, losses, and price offers of marginal units. On any given hour of any given day the market clearing price for electricity can move from very low to very high as more expensive units are brought online to meet the load curve. The price for all electricity is the price set by the marginal unit, often natural gas. Thus, the price of electricity from a baseload plant may have a MISO value that varies from \$10 per MWh during off peak time to \$200 per MWh during peak time. This is not the price paid by consumers. The transaction can be looked at as such: First, the utility pays MISO \$200 and then MISO pays the \$200 to the owner of the energy that was put on the grid. If the utility owns, or has the energy (or capacity) under contract, then the utility is

reimbursed the \$200.<sup>16</sup> The cost to ratepayers is the actual cost of generation or the cost of the contract that created the generation. This MISO market has not been analyzed in past SEAs.

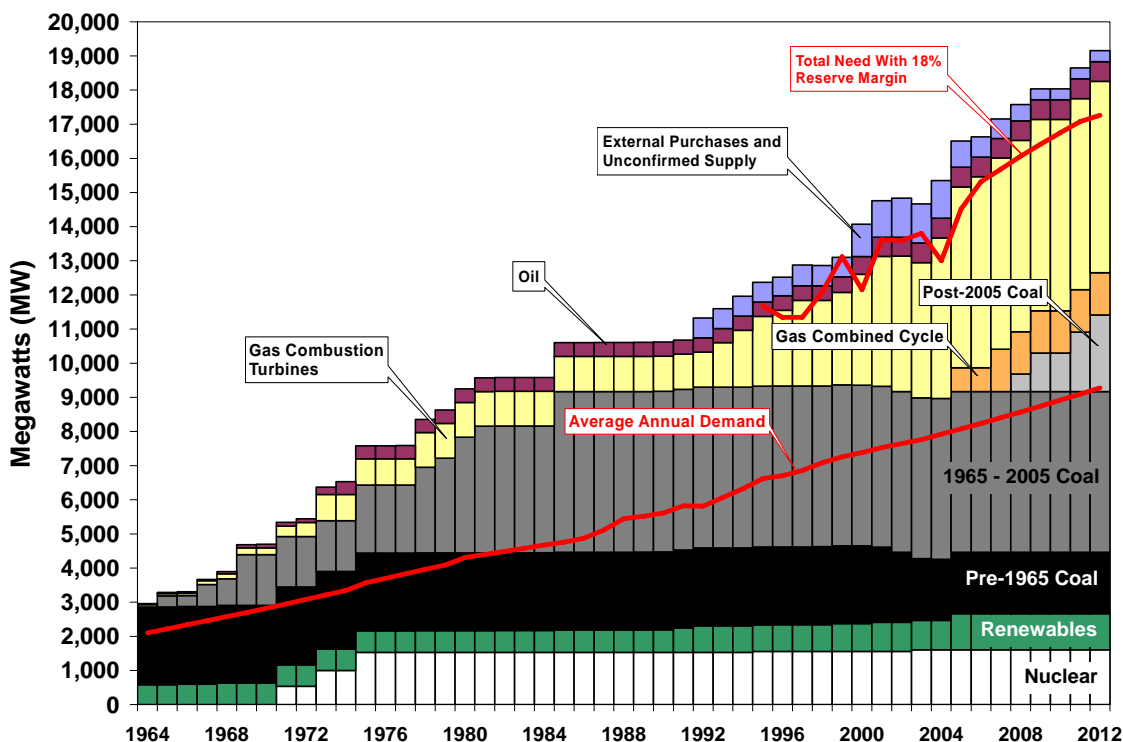
In past SEAs, the focus of this section has been on the costs associated with purchased power and on environmental outcomes. As discussed above, the market for purchased power is transforming. The reliance on purchased power contracts for peaking power fired by natural gas appears to be waning. More and more natural gas-fired peaking generation capacity added over the next six years is going to be owned directly by the utilities or acquired through leased generation contracts with affiliates of the utilities. At the same time, some of the new wind generation is being developed by IPPs and is being acquired through long-term purchase contracts by some Wisconsin utilities. Other Wisconsin utilities are choosing to directly own their wind generation resources. Lastly, entities can use the Day 2 Market to obtain supply, the pricing of which is monitored by an independent party to avoid market manipulation. The generators' offers are capped at \$1,000 per MWh; however, the LMP price at a given location can exceed the generator offer cap as a result of congestion and losses.

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<sup>16</sup> This example is an oversimplification, as WPPI points out, because it ignores other complex market features such as marginal congestion costs, marginal losses, FTR revenue, and other MISO Day 2 wholesale market features.

What does this mean for this analysis? Figure 4-01 shows that we are moving into fewer purchased power contracts for units with low capital costs but relatively high marginal energy costs. These are the natural gas-fired combined-cycle units and natural gas-fired CT units. At the same time we are seeing more purchased power agreements for relatively high capital costs but low marginal energy cost for such generation as nuclear and wind.

Figure 4-01 Wisconsin Generation Capacity



The final topic in this section is an assessment of whether competitive markets are contributing to an environmentally sound source of electricity for the public. According to conventional economic theory, competitive markets will consider all direct economic costs as well as any indirect costs associated with externalities, such as pollutants, as long as the externalities in question have been regulated by either command and control methods or by some form of monetization in the form of taxes or emission allowance trading, for instance. In cases where legitimate externalities have not been so factored in, the competitive marketplace will ordinarily ignore any of the non-private costs associated with such externalities. There may be some exceptions in cases where the public may be willing to pay a premium for goods or services with a real or perceived better environmental footprint. In Wisconsin, such an example might be individual utilities offering green pricing programs whereby customers may buy wind power.

With this background, competitive power markets have been contributing to an environmentally sound source in the cases of pollutants and externalities that are

under public policy supervision.<sup>17</sup> Examples would include sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and particulate pollution. On the other hand, competitive power markets may not be contributing to an environmentally sound source in the cases of pollutants and legitimate externalities that are not under appropriate or adequate public policy supervision. Examples might include mercury deposition, permanent nuclear waste disposal, and greenhouse gases.

### **Assessment of Whether Sufficient Electric Capacity and Energy will be Available to the Public at a Reasonable Price**

The Commission has recently approved CPCNs for three new, large, coal-fired baseload generation units. The Commission has also approved CPCNs for new combined-cycle natural gas generation, wind generation, and CT natural gas generation. As noted in Table 2-01, planning reserve margins are projected to be above, or very close to, 18 percent through 2012. Both the magnitude and the mix of new electric generation appear to answer the statutory question in the affirmative. Wisconsin's electric generation future is in much better shape now than it has been in the past with respect to capacity and energy.

However, several issues remain outstanding on the capacity and energy future.

First, Wisconsin still has several very old, small coal-fired boilers. These units tend to have low levels of efficiency and tend to be much more difficult to control regarding pollution reduction requirements that have been established by the U.S. Environmental Protection Agency (EPA) through their promulgated Clean Air Interstate Rule and Clean Air Mercury Rule. It is very likely that some older coal-fired units will be retired rather than controlled. If units are retired it must be recognized that these units have been running as baseload units, so even though their name plate capacity may be small, their contribution to generation is often much larger than the energy generated from, for example, a new CT. The reason is simple—although they are not very efficient and they contribute disproportionately to pollution, they have been cheap to operate. Wisconsin currently has over 5,000 GWh of electricity annually generated by coal-fired units that were built prior to 1960. This represents about 1,000 MW of capacity. In its comments, WPPI supported further analysis and modernization of this older fleet.

Second, Wisconsin's governor and legislature have enacted new policy options including a renewable energy portfolio requirement. Currently, wind generation is the lowest-cost renewable energy option. A renewable energy portfolio requirement that calls for 2,000 MW of renewable capacity would affect Wisconsin's optimal energy expansion path. In 2007, Wisconsin will have a significant fleet of natural gas-fired CTs and combined-cycle units. These units are critical to a generation fleet with significant wind capacity. Wind, while having very low marginal costs of generation, has unpredictable availability. To complement the low and unpredictable availability

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<sup>17</sup> Appropriate public policy supervision assumes that the appropriate amount of control or mitigation takes place. In practice, there is significant ongoing political and scientific debate about the appropriate amount of control or mitigation. Such debate also concerns what constitute appropriate externalities as well.

factor, wind needs to have rapidly available alternative generation capacity to be used and useful. Natural gas-fired CTs and combined-cycle units can fit this need. This may imply a higher capacity utilization for CTs and combined-cycle units. This raises a concern because Wisconsin does have a number of older CTs, some running on fuel oil. These units have been economic to hold onto given their relatively low capacity utilization. However, if wind resources are expanded either in Wisconsin or outside of Wisconsin for use in Wisconsin, some CTs may need to be replaced with newer, more reliable and less polluting units.

The financial benefits and costs of these alternatives need to be addressed in a contested case for the Commission to fully appreciate all the implications.

## ENERGY EFFICIENCY AND RENEWABLE RESOURCES

### Governor's Task Force on Energy Efficiency and Renewables

In September 2003, Governor Jim Doyle's Task Force on Energy Efficiency and Renewables began its work. This task force was charged with restoring Wisconsin's leadership in conservation and renewable energy. The task force released its report in October 2004. Highlights of the energy efficiency recommendations in the October 2004 report include:

- Every four to five years the Commission should have a proceeding to set overall savings targets for energy efficiency, set funding levels to reach these targets, and consider utility requests to retain a portion of their funds to administer programs in their territory for larger commercial and industrial customers.
- Wisconsin should adopt structural changes to protect public benefits funds, such as a trust fund or an independent fiscal agent to hold funds exclusively for public benefits.
- DOA would continue to be the overall program administrator of public benefits.
- The Commission would oversee independent measurement and evaluation activity.
- The Commission and the utilities would be deemed to have satisfied the requirements of the Energy Priorities Law with respect to customer-side energy efficiency if the utilities meet the funding requirements set by the Commission and these funds are reserved for energy efficiency.

The task force recommended that the governor and the legislature take the following actions to encourage greater use of renewable resources for the generation of electricity:

- Establish a new, higher standard for renewable energy use in the state, averaging 10 percent statewide by 2015. To meet the new standard, each electric provider would be required to increase the portion of its retail sales from renewable resources by 6 percent above its three-year average for 2001 to 2003.



The new standard would also be better integrated with the application of the Energy Priorities Law and the SEA.

- Establish a target for state agencies to purchase at least 10 percent of their electricity from renewable resources by 2007 and at least 20 percent by 2011.
- Create a sales and use tax exemption for customer-owned renewable energy systems such as small wind turbines, solar panels and solar water-heating services.
- Encourage the research and development of renewable energy systems, particularly anaerobic digesters, in rural Wisconsin.

Another outcome of the Governor's Task Force was the commissioning of an energy efficiency potential study by the Energy Center of Wisconsin (ECW). The purpose of the study is to aid policy-makers in determining the appropriate energy efficiency goals and funding levels. This study was released in December 2005.

### **Energy Efficiency and Renewable Resource Act (2005 Wisconsin Act 141)**

This legislation, passed recently, will substantially revise the funding and structure of energy efficiency and renewable resource programs in the state of Wisconsin. This legislation is based on the recommendations of the previously explained Governor's Task Force on Energy Efficiency and Renewables and provides:

- Statewide energy efficiency programs collectively funded by investor-owned electric and natural gas utilities. Funding for these programs is secured by requiring the utilities to directly contract with a program administrator.
- Allowance for utility-administered and large customer energy efficiency programs.
- Funding level of 1.2 percent of annual operating revenues (about \$82.4 million). The Commission may specify, subject to review by the Joint Committee on Finance, a higher funding level based on a list of criteria.
- Commission oversight of the statewide and utility programs. The Commission must conduct, at least every four years, a proceeding to evaluate the statewide and utility programs and to set or revise goals, priorities, and measurable targets for the programs.
- That state agencies purchase at least 10 percent of their electricity from renewable resources by 2007 and at least 20 percent by 2011.
- That each Wisconsin electric provider increase its RPS to 6 percent above its three-year average for 2001-2003. The statewide goal is 10 percent renewable electricity by 2015.

## Energy Efficiency

### Status of Energy Efficiency Efforts

Conservation and energy efficiency efforts encourage customers to reduce their use of energy. Conservation saves energy or reduces demand by reducing the level of energy services (*e.g.* turning off lights, changing thermostat settings, taking shorter showers, etc.). Conservation generally involves behavioral changes. Energy efficiency is the application of technologies that use less energy while producing the same or better level of energy services. These technologies are generally long-lasting and save energy whenever the equipment is in operation.

The level of electric energy and demand savings achieved through conservation and energy efficiency affects how many power plants or how much transmission capacity needs to be built. Historically, utilities were responsible for both electric and natural gas conservation and energy efficiency services. Major changes to the delivery of conservation and energy efficiency services occurred as a result of 1999 Wisconsin Act 9 (Act 9). These major changes were in response to a sharp decline in utility conservation and energy efficiency spending and savings in the mid-1990s and to address funding and delivery in anticipation of an electric retail access environment. Act 9 established a new funding mechanism, to be administered by DOA for programs for electric and natural gas low-income assistance, energy conservation and efficiency, environmental research and development, and renewable resources. These are called Public Benefits Programs.

In addition to this new funding for conservation and energy efficiency, Act 9 provided for the annual transfer of funds equal to the amount Wisconsin Class A, investor-owned utilities spent for electric and natural gas public benefits type programs in 1998 from the utilities to the Public Benefits Fund administered by DOA. These utilities transfer about \$45 million annually to the Public Benefits Fund for the provision of conservation and energy efficiency services. These services are provided through the Focus on Energy (FOE) umbrella. The utilities also retain about \$25 million of their 1998 conservation and energy efficiency expenditures for customer service conservation and load management activities. Conservation and energy efficiency services through DOA-administered Public Benefits Programs were first made available to ratepayers in 2001. However, 2003 was the first year of full funding for Public Benefits Programs, as utilities retained some Public Benefits Funds through the transition period. At the present time, the Public Benefits Program is not fully funded.

The recently passed 2005 Wisconsin Act 141 (Act 141) requires statewide energy efficiency and renewable resource program funding to be at a level equivalent to 1.2 percent of utility operating revenues. These programs required by Act 141 will first be available on July 1, 2007.

The following graphs address only electric conservation and energy efficiency efforts. They do not include natural gas, renewable energy, or low-income expenditures and savings. Figure 5-01 shows the aggregate historical and projected electric conservation



and energy efficiency expenditures of Wisconsin utilities and the statewide programs (public benefits through July 1, 2007, and Act 141-required programs thereafter) for calendar years 2004-2007 and 2012. Figures 5-02 and 5-03 provide the level of electric demand and energy savings, respectively. The charts include the aggregate expenditures and savings of the following utilities: MGE, NSPW, SWL&P, WEPCO, WP&L, and WPSC. Expenditures and savings for DPC and WPPI are also included.<sup>18</sup> DOA provided actual data for 2004, while the utilities provided actual data for 2004 and 2005. Expenditures and savings for the remaining years are projected. DOA generally reports expenditures and results of Public Benefits Programs on a fiscal year basis. For consistency, Public Benefits expenditures and savings were converted to a calendar year. Years 2007 and 2012 include estimates based on Act 141 requirements. The dollars and savings for utility-administered programs decrease substantially because by 2012 both We Energies and WPSC will have discontinued their programs ordered in construction cases. The statewide energy efficiency dollars and savings increase because of Act 141. This is due primarily to having secured funding, but also because of a small increase in required funding levels.

It is important to note several important gaps in the figures below. Utility customer service conservation expenditures are included. However, little or no savings are reflected for utility customer service conservation activities. This is because many of these services do not lend themselves to tracking and verifying the savings. Also, low-income weatherization services are provided through Public Benefits funds. Low-income weatherization services are just one component of services provided to low-income households to assist them in meeting their critical energy needs in a safe manner. Because of this unique focus, expenditures and savings for this program are not comparable to expenditures and savings for other conservation and energy efficiency services and have not been included in the figures below. Based on DOA statistics, about \$31.5 million was spent on low-income weatherization in calendar year 2004 and about \$40 million is scheduled to be spent on low-income weatherization in calendar year 2005. These expenditures include both natural gas and electric expenditures.

In addition to the electric energy efficiency savings reflected in the figures below, natural gas savings have and will continue to occur. Total natural gas energy efficiency expenditures by the utilities and DOA were about \$20 million in 2005. With the exception of a temporary increase to about \$24 million in 2006, natural gas energy efficiency expenditures are expected to remain at roughly the same level through 2012. Annual therm savings are expected to be between 11 and 15 million for the years 2005 through 2012.

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<sup>18</sup> Although electric cooperatives and municipal utilities that are not members of DPC or WPPI also provide conservation and energy efficiency services, their costs and savings are not included. Not all of these electric cooperatives and municipal utilities track achievement of energy and demand savings. Total spending of these utilities are less than 1 percent of the total expenditures of the utilities included in the figures. Because of the relative size of the electric cooperatives and municipal utilities, this omission does not greatly affect the aggregate totals.

Figure 5-01 Annual Electric Energy Efficiency Expenditures

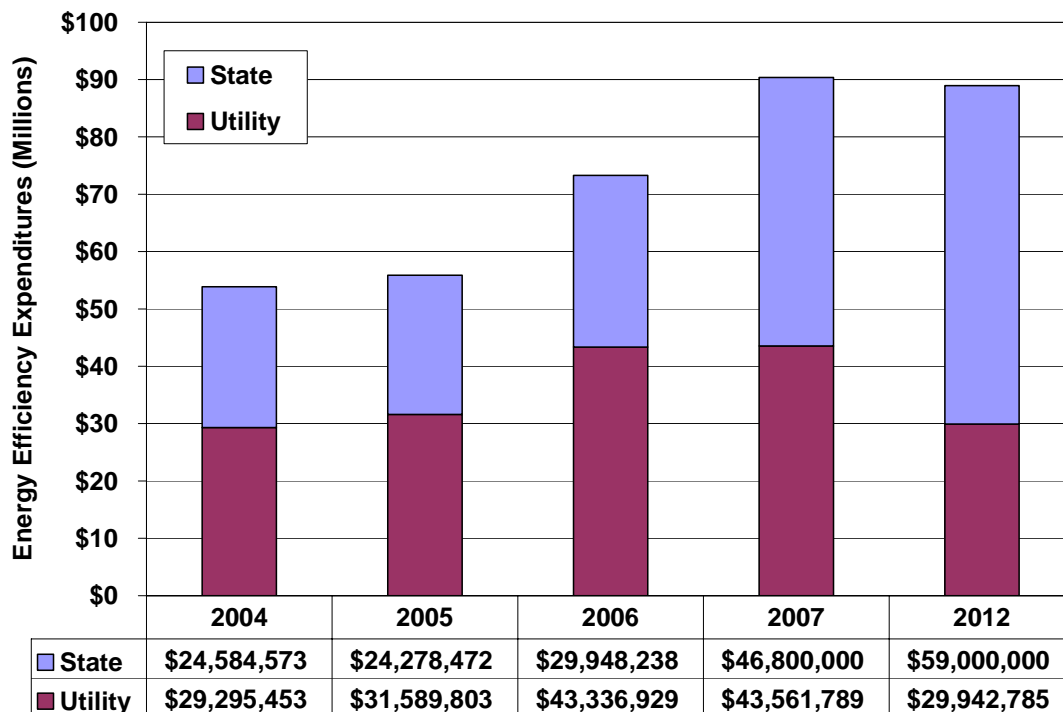


Figure 5-02 Annual Electric Energy Savings, MWh

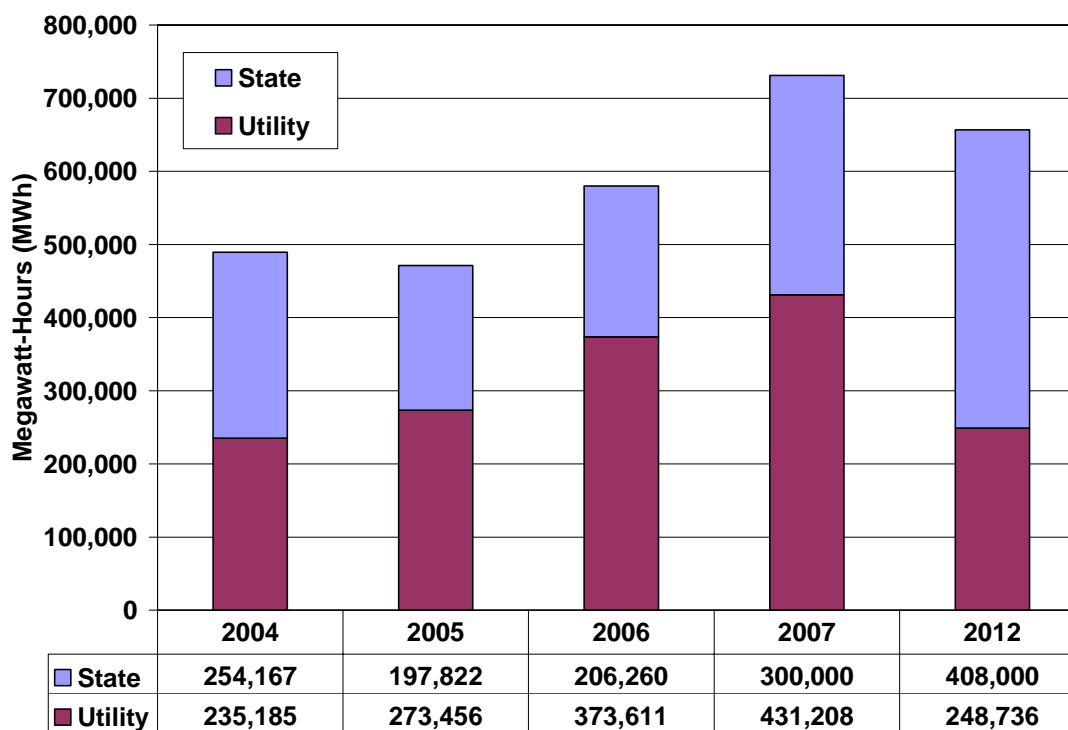
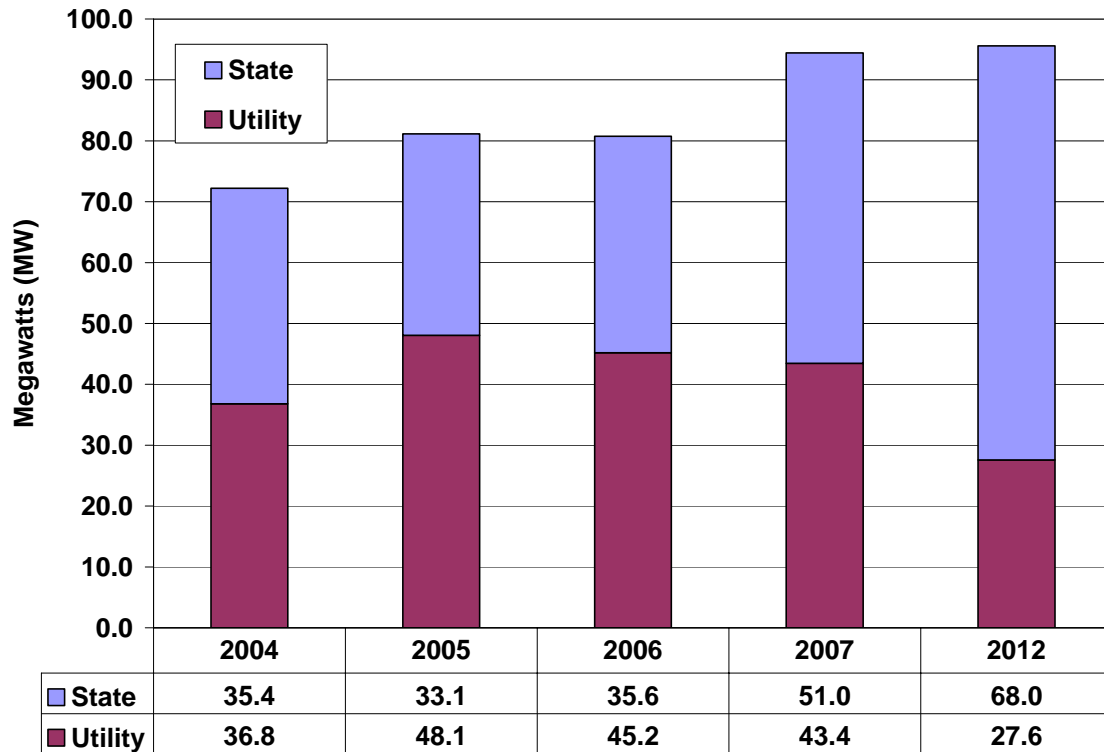


Figure 5-03 Demand Savings, MW



## Renewable Resources

### Generation of Electricity from Renewable Resources

The generation of electricity from renewable sources is expected to increase steadily during the planning period of the SEA. This growth will come from three areas — onsite customer generation, green pricing programs, and utility efforts to comply with the renewable portfolio standard (RPS). In 2004, about 2,290,232 MWh or 3.44 percent of all electrical energy sold in Wisconsin was generated from renewable resources.

Currently, Wis. Stat. § 196.378 requires all retail electric providers to provide a minimum portion of their total retail sales from renewable resources. It establishes a baseline based on each provider's renewable percentage for 2001, 2002, and 2003. By 2010, each electric provider must increase its renewable percentage by 2 percent, and by 2015 by 6 percent. The overall state goal is that by December 31, 2015, 10 percent of all electric energy consumed in the state will come from renewable resources.

### Customer-Sited Renewable Generation

A small portion, approximately 4.5 percent, of the Public Benefits Fund goes to the FOE Renewable Energy Program operated by Wisconsin Renewable Energy Network. For the calendar year 2005, the FOE renewable energy program had a budget of \$2,305,266 and for 2006 its budget was \$2,128,608. Customer-sited technologies covered by the FOE program include:

- Photovoltaic or solar electric;
- Small-scale wind;
- Biomass;
- Heat pumps; and
- Solar water and space heating.

Incentives to encourage greater use of these renewable technologies by utility customers include cash-back awards, implementation grants, business and marketing grants, demonstration grants, feasibility grants, and technical assistance.

For fiscal year 2005, energy savings produced by the FOE renewable energy program were determined to be 20.8 million kWh and 900,000 therms with an annual monetary value of \$2.9 million.

### **Hydropower**

Small hydropower plants exist along the Fox, Menomonee, Oconto, Peshtigo, Wisconsin, Chippewa, Flambeau, and Wolf Rivers. For the years 2001-2003 Wisconsin's 500 MW of hydro capacity produced an average of 2,180,700 MWh of electricity. Annual hydro production is highly dependent of average rainfall and can vary from year to year by as much as 25 percent. There is little potential for increasing the capacity of this renewable resource, aside from the upgrading of existing facilities and refurbishing of a number of small, recently retired units.

### **Wind**

There are currently 53 MW of wind power capacity in Wisconsin and an additional 884 MW under development. MGE operates 11.2 MW of capacity in the towns of Lincoln and Red River in Kewaunee County. WPSC has 9.2 MW of wind in the town of Lincoln and owns the 1.2 MW Zirbel project in the town of Glenmore, Brown County. WEPCO operates two 660 kW turbines at Bryon in Fond du Lac County. In 2001, Badger Windpower, LLC brought online a 30 MW wind farm east of Montfort in Iowa County.

Wisconsin electric utilities and IPPs have proposed ten new wind power projects for construction in the next few years. In July 2005, the Commission granted a CPCN to Forward Energy LLC (Forward), owned by Invenergy Wind LLC, to build a 200 MW wind project in Dodge and Fond du Lac Counties. Power from the Forward project is under contract to go to WP&L, WPSC, MG&E, and WPPI. We Energies plans to develop 160-220 MW of new wind capacity that We Energies would own.

The federal production tax credit (PTC) plays a major role in the economics of wind power projects. The PTC, currently 1.9 cents per kWh, is available for ten years to renewable energy projects that go online before December 31, 2007.

The environmental effects of wind energy are mostly positive, but there are also some potentially negative impacts. The environmental benefits derive from the fact that using wind to generate electricity produces no carbon dioxide (CO<sub>2</sub>), SO<sub>2</sub>, NO<sub>x</sub>,

particulate matter or other air emissions. Environmental and other concerns associated with wind power include, aesthetics, sound, bird and bat interactions, and land use impacts. These issues must be taken into consideration when siting wind energy facilities.

### **Biomass**

At the present time, the largest category of non-hydro renewable electric energy is biomass. This category includes wood, wood and paper waste, herbaceous plants, plant products, and biogas from landfills, wastewater treatment, and on-farm anaerobic digestion of manure. Xcel burns wood fuel at Bayfront 4 in Ashland (36 MW) and at French Island (31.3 MW). The Minergy, LLC facility, located in Neenah, has 6.5 MW of biomass capacity. Landfill gas projects provide a total of 39.2 MW of capacity and more and more large animal operations are using anaerobic digestion of manure to generate electricity.

### **Solar**

PSC records show 21 utility-owned photovoltaic (PV) or solar electric facilities in Wisconsin with a total capacity of 82.2 kW. However, the most appropriate and cost effective application of a PV system is for onsite generation. Several factors will increase the number of PV systems in the next few years. Those factors include increasing fossil fuel prices, rising electric rates, federal tax credits, Focus on Energy incentives and electric buy back rates such as the 22.5 cents per kWh offered by We Energies.

## **PUBLIC HEALTH AND SAFETY AND ENVIRONMENTAL PROTECTION**

### **Generation Overview**

The production of electricity affects the environment, communities, and public health. Producing electricity creates wastes and uses limited resources such as land and water. Different power plant technologies and fuels used to fulfill the state's energy demand produces tradeoffs between public health and environmental impacts versus need and cost. While there are often economies of scale for larger generation plants, it causes more concentrated impacts to nearby communities. Another consequence of maintaining fewer but larger power generation plants is the need for more transmission lines which can result in other environmental impacts.

### **Types of Generation**

Generally, more than half of the electricity used in Wisconsin is generated by the burning of coal. Five to ten percent of total generation is from less efficient (compared to newer units), more polluting older coal units—those built before 1960. Approximately 15 to 20 percent of the electrical energy consumed in Wisconsin is supplied by nuclear facilities. Natural gas is used to generate less than 5 percent of the electricity produced in Wisconsin, while renewables account for less than 1 percent. On a percentage basis, Wisconsin relies more on coal-fired in-state generation as an electric energy source than Minnesota, Illinois, or the U.S. in total.

## Clean Coal Study Group

As a part of Conserve Wisconsin, Governor Doyle has asked the Commission and DNR to investigate IGCC technology and its potential for the future energy needs of Wisconsin.

IGCC converts coal into gas. The gas is cleaned and then burned in a combined-cycle gas turbine power plant. IGCC significantly reduces air emissions, water use and industrial waste, but there are unanswered questions about the technology's reliability and cost. The Clean Coal Study Group was created to analyze the technology and answer the questions about reliability and cost. With the leadership of PSC Commissioner Mark Meyer and DNR Air and Waste Administrator Al Shea, the study group members included environmental organizations, customer and labor groups, research institutions and electricity providers. The group met monthly to hear from experts including the Electric Power Research Institute (EPRI), gasification vendors, project developers and environmental analysts. The group also traveled to Terre Haute, Indiana in 2006 to tour an IGCC facility, one of two commercial operations in the U.S. The group provided Governor Doyle with a final report early in 2007.

## General Types of Pollutants

One of the major sources of air pollution in the state is electric generation facilities. Table 7-01 shows which pollutants power plants emit and which pollutants other industries and vehicles emit.

Table 7-01 Major Sources of Air Pollutants

Pollutant	Power Plants	Vehicles	Industry
Carbon Dioxide	X	X	X
Carbon Monoxide	-	X	X
Volatile Organic Compounds	-	X	X
Nitrogen Oxides	X	X	Some
Particulate Matter	X	X	X
Sulfur Oxides	X	-	-
Mercury*	X	-	X

\* Industry emits some mercury from industrial coal combustion. Industrial emissions of mercury are significant when atmospheric releases of mercury from non combustion activities are included.

Efficiency is one means of reducing environmental impacts. As different generation technologies reach higher efficiency levels, fewer pollutants are potentially released for every unit of fuel consumed. This is especially relevant to the use of fossil fuels that causes the majority of the state's air pollution (Table 7-02).

Table 7-02 General Efficiency of Power Plants

Plant Operation	Approximate Efficiency
<b>Coal Plants</b>	
Traditional	30-35%
Super-Critical Pulverized Coal (SCPC)	42%
Integrated Gasification Combined-Cycle (IGCC)	42-46%
Cogeneration*	40-50%
<b>Natural Gas Plants</b>	
Older Combustion Turbines (CT)	26%
Newer Combustion Turbines (CT)	36%
Combined-Cycle (CC)	50-55%
Cogeneration *	60-70%
<b>Fuel Oil</b>	
Internal Combustion Engines	35%

\* All power plants produce electricity. Cogeneration plants produce electricity and steam.

There is a definite trend towards improving the technology for both coal and natural gas fuels to afford higher levels of efficiency.

Comparing the pollutants emitted from a sampling of Wisconsin plants based on the type of plant and type of fuel shows that the use of the latest pollutant control methods can produce a significant reduction in the pollutants emitted. For the four pollutants CO<sub>2</sub>, particulate matter less than ten microns in diameter (PM<sub>10</sub>), NO<sub>x</sub>, and sulfur oxides (SO<sub>x</sub>), combined-cycle natural gas-burning plants produce the lowest level of pollutants per MWh of electricity generated. In comparison to other types of natural gas-burning generation, newer CT plants produce the next lowest, followed by older CT plants. Similarly, super-critical pulverized coal (SCPC) coal burning plants produce fewer emissions than older technology coal plants, especially SO<sub>x</sub> and NO<sub>x</sub> pollutants. Whereas, fuel oil burning internal combustion engines can produce as much or more CO<sub>2</sub>, PM<sub>10</sub>, NO<sub>x</sub>, and SO<sub>x</sub> pollutants as some coal-burning plants.

## Health and Environmental Impacts

Fuel efficiency and increasingly advanced control technologies for Wisconsin's power plants is important in reducing their emissions of pollutants. The general health and environmental impacts caused by these pollutants are listed in Table 7-03.

Table 7-03 Health and Environmental Impacts from Pollutants Emitted by Electric Generation Facilities

Pollutant	Impacts	Regulated
Carbon Dioxide	Environmental Impacts – a greenhouse gas that contributes to global warming	-
Carbon Monoxide	Health Impacts – heart strain	X
Particulate Matter (PM <sub>10</sub> and PM <sub>2.5</sub> )	Environmental Impacts – haze, smog, can damage plants Health Impacts – lung damage, asthma bronchitis, pneumonia Property Damage – can dirty and discolor structures, clothes, and furniture	X
Volatile Organic Compounds	Environmental Impacts – smog, contributes to elevated ozone levels, and can damage plants Health Impacts – lung damage, asthma bronchitis, pneumonia	X
Nitrogen Oxides	Environmental Impacts - acid rain, smog, contributes to elevated particulate levels, N <sub>2</sub> O is a greenhouse gas Health Impacts – lung damage, asthma, bronchitis, pneumonia	X
Sulfur Oxides	Environmental Impacts - acid rain, contributes to elevated particulate levels, harmful to plants Health Impacts - lung damage, asthma, bronchitis, pneumonia Property Damage – can deteriorate fabrics, corrode metals, damage and stain stone structures	Only SO <sub>2</sub>
Mercury	Environmental Impacts – bioaccumulation of mercury in wildlife Health Impacts – consumption of fish with elevated mercury levels can cause damage to nervous systems, especially in children and fetuses	X

## Transmission Overview

Utilities are investing in the rebuilding and upgrade of aging transmission and distribution lines. This increases the adequacy, reliability, and safety of these lines. In addition, utilities are adding distribution substations to serve growing local use of electricity. These new distribution substations and the new transmission lines that serve them will greatly increase reliability. The primary reason for new transmission and distribution facilities is to provide adequate voltage to customers and not damage other utility or customer equipment when contingencies occur. The most common contingencies are tree, animal, and vehicle contacts; storms; and electrical system component failure. When these incidents occur, system protective devices quickly isolate the incident and minimize the size of the outage and any further damage. Utility vegetation management programs clear growth under lines to further minimize outages.

Transmission projects that require new ROW and are not in a current application process are identified in Table A-03 and will need to avoid or mitigate impacts to a number of sensitive and cultural resources. Input from resource experts, communities, property owners, and the public will be necessary to properly site these new transmission corridors.

## Federal and State Regulations

The following changes to the federal and state regulations will impact generation and transmission utility operations in the state of Wisconsin. These regulations regarding



environmental issues are currently in a state of flux, and need to be tracked and analyzed by utility personnel, regulators and the public on an ongoing basis.

- Federal Energy Policy Act of 2005 – encourages the construction of renewable and lower polluting electric generation technologies and the installation of air pollution control facilities; contains the establishment of “national interest transmission corridors” and other transmission siting provisions
- Clean Air Mercury Rule (CAMR) – establishes federal caps on mercury emissions for coal-fired generators and a cap-and-trade program
- National Ambient Air Quality Standards –proposed revisions to the EPA fine particulate matter (PM<sub>2.5</sub>) standards
- Clean Air Interstate Rule (CAIR) – establishes federal caps on combined power plant emissions of sulfur dioxide and nitrogen oxide and sets up a cap-and-trade program for the two pollutants
- Wisconsin Shared Revenue Program (Wis. Stat. ch. 79) – provides monetary incentives to local communities for new power plant construction
- 2005 Wisconsin Act 141 – Revises the funding and structure of energy efficiency and renewable resource programs in the state of Wisconsin
- 2003 Wisconsin Act 89 – establishes a pre-application process for choosing transmission route alternatives and prioritizes the use of existing corridors for transmission siting, establishes joint PSC and DNR review of proposed natural gas pipeline routes and issuance of respective permits and approvals
- 2005 Wisconsin Act 24 – provides for the necessary easements of municipal and county lands for transmission projects
- High-Voltage Transmission Line Impact Fees (Wis. Stat. § 16.969) – provides monetary incentives to local communities for new high-voltage transmission construction

## Public Involvement

Public involvement in the review of transmission and generation projects is an important part of the Commission review process. The Commission regularly facilitates public meetings on transmission line siting and new generation. At these meetings the public is sought out to provide issues of concern. Through the Commission’s ERF system, all applications and documents can now be routinely viewed by any member of the public with internet access. In addition, individuals can subscribe for a particular construction project docket and receive automatic e-mails when new documents are uploaded onto the system, without the delay of a traditional paper system.

## RATE AND COST TRENDS

Table 8-04 summarizes the regulatory structures that currently exist in the Midwest. The table identifies both the regulated-rate states and the retail-choice states. The

table illustrates that the ability to make rate comparisons between these states is not straightforward. The comparison to Wisconsin rates in some cases is often an apples to oranges exercise as bankruptcy and financial instability is a risk that the Wisconsin regulatory approach does not create.

Some specific examples of state to state differences follow:

- Among regulatory structures, there are states with vertically integrated utilities and some with stand-alone transmission companies, like in Wisconsin.
- Some states have dollar-for-dollar fuel cost pass through, while some do not.
- Some states, as part of retail restructuring, have given providers the option of foregoing fuel cost recovery. Illinois was one of those states.
- In some cases legislatively enacted rate reductions and freezes are soon to expire; some have already expired. The consequence is these states will be entering periods of rate increases that have not yet shown up in the national data that has been used to compile Figures 8-01 through 8-03 and Tables 8-01 through 8-03.
- In Ohio, a competitive auction to provide power and energy to First Energy was deemed faulty by the Ohio Public Utilities Commission (Ohio PUC) due to high prices and the lack of competitors.<sup>19</sup>
- The Ohio PUC has granted First Energy deferrals for increases in fuel costs for the 2006 to 2008 time period that will not be collected from ratepayers and will not affect rates until some time in 2012.<sup>20</sup>
- In 1997-1998, when natural gas prices were not expected to significantly increase, CE opted for a freeze on any fuel cost recovery changes with the expectation that lower or stable natural gas fuel costs would increase its profitability. In hindsight that assumption was wrong; but the company's parent holding company still was able to make record profits because it sold its coal baseload plants at a premium and was able to keep the profits above book value and not return such profits to ratepayers. Any excess power CE subsequently had from its remaining baseload plants (mostly nuclear) was sold into the wholesale market at much higher market prices established by the higher cost of natural gas. The entities that bought the baseload coal plants from CE were also able to profit from this generation by selling the output of the plants they now owned into a market with much higher energy prices.
- In September 2006, Illinois providers conducted an auction for wholesale purchases of electric capacity and energy. This auction is very controversial.

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<sup>19</sup> 2005 End of Year Review, Public Utility Commission of Ohio, at [www.puco.ohio.gov](http://www.puco.ohio.gov).

<sup>20</sup> 2005 End of Year Review, Public Utility Commission of Ohio, at [www.puco.ohio.gov](http://www.puco.ohio.gov).

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Results from the wholesale auction process indicate a 25 to 40 percent increase in retail electric rates.<sup>21</sup> As an interim measure, CE has proposed capping residential retail rate increases to 10 percent in 2007, 10 percent in 2008, and 10 percent in 2009. Under the CE proposal, customers would be able to opt into this plan, or choose market-based electricity prices. To the extent the auction process results in price increases greater than these capped values, the associated dollar amounts will be deferred with 6.5 percent interest for ratepayer recovery beginning in 2010.<sup>22</sup> This proposed plan terminates should CE's financial condition become seriously distressed or if credit rating agencies lower the company's rating below investment grade. The auction process is still undergoing legal review by the Illinois courts. The rate stabilization plan has been approved by the Illinois Commerce Commission. The Illinois Legislature in January 2007 considered a bill that would impose a rate freeze and reintroduce cost-of-service ratemaking instead of transitioning to the wholesale auction approach.

- RTOs create seams and additional transmission tariffs that do not foster the most cost efficient exchange of electric power. For instance, CE is in the PJM RTO; yet, CE borders Wisconsin. Under the rules and tariffs of PJM, CE can make more profit selling its energy to the east coast market than to Wisconsin providers. This situation was created when FERC allowed CE to join PJM. The Wisconsin Commission is vigorously intervening at the FERC and MISO to have mechanisms in place that hold Wisconsin ratepayers harmless from such actions.
- Wisconsin is ahead of other states with respect to the construction cycle of new electric generation and transmission facilities needed to address future reliability.

For all of these reasons extreme care should be used when making rate comparisons across states. A more appropriate examination might require review of rates over a ten or twenty year period as the vagaries of the alternative regulatory structures work themselves out.

Changes in the ownership of the transmission system and of generation plants, construction and timing of new utility generation plant, fuel costs, the emergence of the MISO Day 2 Market for power have had, or will have a profound impact on the rates Wisconsin customers pay. How these costs are handled differently in other states when establishing rates will influence the competitive position of rates between Wisconsin and these other states.

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<sup>21</sup> "Electric Bills to Soar," Chicago Tribune, September 15, 2006, and "Illinois Customers Take Big Hit," St. Louis Post-Dispatch, September 16, 2006.

<sup>22</sup> "Commonwealth Edison Adjusts Rate Stabilization Proposal in Advance of Illinois Power Auction," Electric Utility Week, September 4, 2006, Platts.

That said, in 2005, retail Wisconsin residential rates were higher than the other Midwest states. Industrial Wisconsin rates have also increased, and are now above the Midwest average. Wisconsin retail commercial rates also increased, but not as rapidly as residential and industrial rates. These changes are shown on Tables 8-01 through 8-03. Wisconsin commercial and industrial rates are still below national averages. Recent rate stabilization and fuel increases in Wisconsin have been driven by factors outside of the Commission's control. Fuel price and purchased power cost increases have constituted about 65 percent of the increases, and new power plant construction to maintain reliability has contributed approximately 25 percent. See Figure 8-01.

Figure 8-01 Actual Electric Rate Increases in 2005 - Significant Factors that Increased Electric Rates

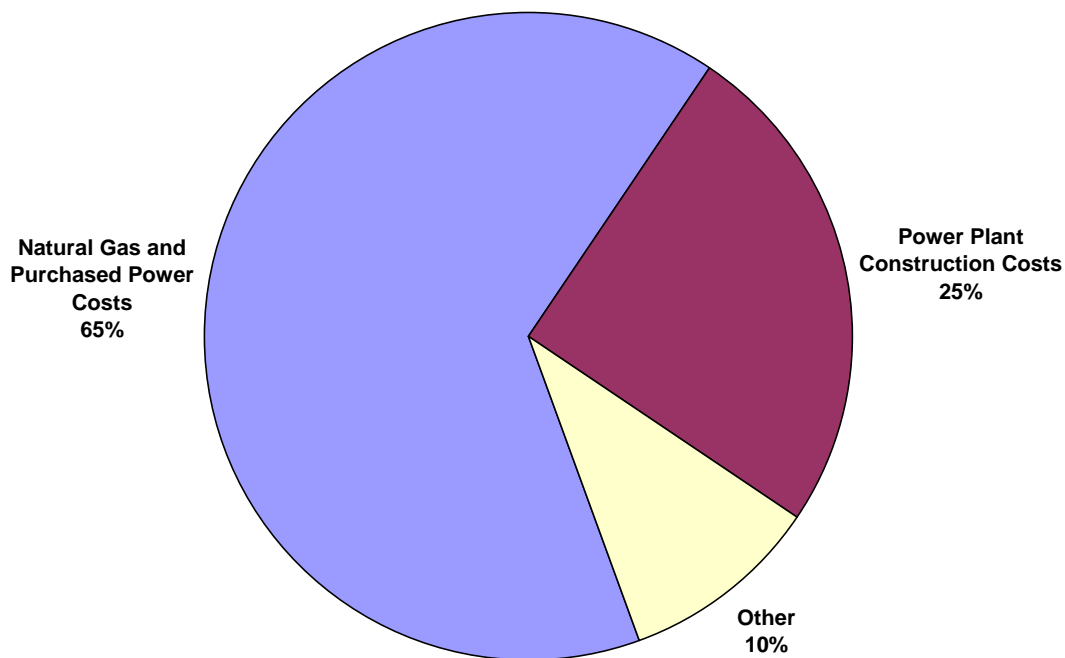


Table 8-01 Residential Average Rates in the Midwest and U.S. (in cents)

	2000	2001	2002	2003	2004	2005
Illinois	8.83	8.70	8.40	8.38	8.37	8.34
Indiana	6.87	6.90	6.90	7.04	7.30	7.49
Iowa	8.37	8.40	8.30	8.57	8.96	9.36
Michigan	8.53	8.40	8.50	8.35	8.33	8.60
Minnesota	7.52	7.60	7.50	7.65	7.92	8.34
Missouri	7.04	7.00	7.10	6.96	6.97	7.08
Ohio	8.61	8.30	8.10	8.27	8.45	8.50
Wisconsin	7.53	7.90	8.10	8.67	9.07	9.64
<b>Midwest Average</b>	<b>7.97</b>	<b>7.90</b>	<b>7.83</b>	<b>7.89</b>	<b>8.17</b>	<b>8.42</b>
<b>U.S. Average</b>	<b>8.21</b>	<b>8.57</b>	<b>8.43</b>	<b>8.70</b>	<b>8.97</b>	<b>9.42</b>

Source: U.S. Department of Energy, Energy Information Agency, Electric Sales and Revenue Reports

Table 8-02 Commercial Average Rates in the Midwest and U.S. (in cents)

	2000	2001	2002	2003	2004	2005
Illinois	7.53	7.40	8.30	7.22	7.54	8.05
Indiana	5.93	5.80	6.00	6.13	6.31	6.54
Iowa	6.57	6.70	6.60	6.24	6.75	6.95
Michigan	7.90	7.60	7.50	7.55	7.57	8.09
Minnesota	6.36	6.00	5.90	6.12	6.31	6.56
Missouri	5.83	5.90	5.90	5.78	5.80	5.88
Ohio	7.61	7.90	7.70	7.60	7.75	7.92
Wisconsin	6.03	6.40	6.50	6.97	7.24	7.61
<b>Midwest Average</b>	<b>6.82</b>	<b>6.76</b>	<b>6.84</b>	<b>6.66</b>	<b>6.91</b>	<b>7.20</b>
<b>U.S. Average</b>	<b>7.36</b>	<b>7.91</b>	<b>7.93</b>	<b>7.98</b>	<b>8.16</b>	<b>8.68</b>

Source: U.S. Department of Energy, Energy Information Agency, Electric Sales and Revenue Reports

Table 8-03 Industrial Average Rates in the Midwest and United States (in cents)

	2000	2001	2002	2003	2004	2005
Illinois	4.76	4.80	5.60	4.91	4.65	4.52
Indiana	3.81	4.00	4.00	3.92	4.13	4.40
Iowa	3.89	4.20	4.00	4.16	4.33	4.57
Michigan	5.10	5.20	4.90	4.96	4.92	5.58
Minnesota	4.57	4.60	4.20	4.36	4.63	5.06
Missouri	4.43	4.50	4.50	4.49	4.62	4.59
Ohio	4.47	4.70	4.70	4.79	4.89	5.03
Wisconsin	4.04	4.30	4.40	4.71	4.93	5.33
<b>Midwest Average</b>	<b>4.43</b>	<b>4.57</b>	<b>4.56</b>	<b>4.51</b>	<b>4.64</b>	<b>4.89</b>
<b>U.S. Average</b>	<b>4.57</b>	<b>5.07</b>	<b>4.84</b>	<b>5.13</b>	<b>5.27</b>	<b>5.57</b>

Source: U.S. Department of Energy, Energy Information Agency, Electric Sales and Revenue Reports

Table 8-04 Regulatory Structures Currently in the Midwest

	Minnesota	Iowa	Wisconsin	Illinois	Michigan	Indiana	Ohio	Missouri
Retail Rates	PUC Regulated	IUB Regulated	PSC Regulated	Choice, legislative 5-15% rate reduction and freeze to 2006. Market based rates 2007.	Choice, legislative freeze ends 2005.	Limited choice, mostly IURC regulated.	Choice. Legislative rate freeze thru market development period 2000-2005. Rate stabilization plans until 2008.	PSC Regulated
IRP Planning	Yes	No	No	No	No	No	No	No
Transmission Structure	VITO	VITO	LSE, Independent	VITO	LSE, Independent	VITO	VITO	VITO
Regional Transmission Organization	MISO	MISO	MISO	PJM & MISO	MISO/PJM	MISO/PJM	PJM & MISO	MISO & SPP
Fuel Pass Through Treatment	Fuel adjustment clause, no dead band.	IPC automatic fuel clause; MidAmerican operates with freeze.	Fuel rules treatment; rate orders set dead band.	CE and Ameren have opted out of automatic fuel clause adjustment.	Automatic fuel adjustment; shareholders are not at risk. Hearing required.	Fuel clause is automatic. No shareholder risk.	No automatic pass through. Fuel rate freeze 2000 to 2005.	NA
Important Retail Choice Rate Developments				Rate freeze expires January 2007. Providers are to obtain electricity using controversial wholesale auction process possibly increasing retail electricity rates by 40 percent. Auction is under legal review. Illinois Commerce Commission approved the CE proposal to limit residential rate increases for 2007-2009 with any underrecovery to be recovered from ratepayers starting in 2010, using a deferral process.			Rate shock upon move to market based rates and lack of competition lead state to implement rate stabilization plans. AEP's Ohio Power gets rate increases of between 7-11% each year 2006-2008. All fuel increases for 2005-2008 for First Energy are deferred.	

VITO = vertically integrated utilities with both generation and transmission ownership

LSE = load serving entity or utility with only generation and distribution lines

Independent = independent transmission company

Choice = some form of retail competition; form varies by state, usually for industrial and commercial customers

SPP-Southwest Power Pool, MISO-Midwest Independent Transmission System Operator, PJM-PJM LLC.

## CHALLENGES

In the near future, the Commission will address a number of policy issues that will affect the reliability of the bulk power system in Wisconsin and the level of retail electric rates charged to Wisconsin ratepayers. Policy decisions on several of these issues will be made directly by the Commission, while Commission policy on others will be dependent upon regulatory policies adopted by FERC, the North American Electric Reliability Organization (NAERO) and MISO. A summary of these policy issues includes:

### Framework for Generation, Transmission, and Energy Efficiency/Renewables Integration

Generally, stakeholder comments in this SEA agree that, from a regulatory perspective, a different form of transmission, generation, and conservation regulatory integration is necessary in Wisconsin. However, here is no consensus on exactly what to change. As bookends there are two models: a completely trust-the-market regulatory approach versus a proscriptive, detailed, contested-case centralized planning process. Neither is suitable for the reality that faces Wisconsin. But, a hybrid approach that is multidimensional involving significant input from stakeholders and the Commission could fit the current electric industry structure.

A hybrid energy planning approach was proposed in the draft SEA that adjusts present information gathering, review, and decision-making to reflect the increasingly regional and market-oriented nature of the procurement and delivery of electricity. One way to accomplish this is to have Commission investigations (the Commission's response to ATC's Access Study Initiative serves as a model) that include Commission staff and stakeholder participation. Aspects of this hybrid approach include:

- **Modify SEA process.** Expand the SEA planning horizon to ten years if MISO and reliability organizations adopt a ten-year planning standard. Require ATC and Wisconsin's electric utility providers to submit information (for review, not approval) that covers a ten-year outlook. At the public hearing there was support for the ten-year outlook.
- **Contested topical cases.** These proceedings could facilitate full stakeholder participation for evolving issues that need to be addressed by the Commission as energy regulatory policy is set. It is not expected that these topical cases would be numerous. Subject matters could include energy efficiency programs; demand and price response tariffs; multi-state transmission collaboratives; reserve criteria review; and renewable portfolio compliance. At the public hearing there was little support for this contested case approach.
- **Investigations (non-contested).** Investigate special situations that are infrequent, such as: reliability events; technology shifts; emissions strategies; and policy approaches. A recent example is the Commission's response to ATC's



Access Study Initiative docket. At the public hearing there was support for this type of investigation.

- **Rulemaking.** The 2005 Wisconsin Act 141 Energy and Efficiency Renewables Act is an example where the Commission will establish rules. Act 141 requires periodic reporting, and requires the Commission to evaluate energy efficiency and renewables programs on a set, periodic basis. The Commission will also be required to set or revise goals, priorities and measurable targets.

Currently there are ongoing collaboratives, studies and analyses, including this SEA, all focused on reviewing alternatives to the current energy planning process in Wisconsin. In their comments, WP&L notes that there are shortcomings of utilizing a seven-year planning horizon, as it is necessary for utilities to plan well beyond that time frame. In general terms, WP&L notes that significant transmission expansion is vital to the state's interests, as well as new generation. MGE commented that it supports rigorous quantitative and qualitative analysis of the benefits and costs of expanding Wisconsin's transmission system. MGE also noted that it supports modifying the SEA process, by expanding the time horizon for planning to match the planning horizons of the MISO MTEP process, which is ten years. In comments, there was little support for a contested case process at the Commission for energy planning purposes. WPPI, Xcel, and We Energies did not provide comments on the hybrid approach. WPSC believes it would be illegal. Citizens' groups supported the concept of 10 to 20 years for a planning study period.

In its comments, WPSC objects to any regulatory framework that integrates generation, transmission, and energy efficiency and uses a "detailed contested-case centralized planning process." WPSC believes that type of situation could possibly occur under the hybrid approach in which the Commission commences, on its own motion, new, non-periodic investigations. WPSC believes the Commission no longer has statutory authority to perform such centralized or integrated planning. WPSC indicates that passage of 1997 Wisconsin Act 204, which eliminated the Advance Plan approach, prevents the SEA or any derivative investigation from performing integrated resource planning. Furthermore, WPSC believes other statutes cannot be construed to give the Commission such integrated planning authority. Moreover, WPSC cites 2005 Wisconsin Act 141 as curtailing the Commission's authority to provide conditional order points for certification, rate cases, or any other proceeding. In WPSC's view, any approach "that encompasses comprehensive planning for transmission that includes renewables and energy efficiency as substitutes or alternatives is seemingly inconsistent with the thrust and direction of 2005 Wisconsin Act 141." Lastly, WPSC notes that present statutes permit "the Governor to enter into interstate compacts on behalf of the state to facilitate agreement among states in the upper Midwest to determine the need for and siting of future transmission facilities." Such authority does not "speak to a planning function, let alone an integrated cross-modal planning authority" for the Commission, according to WPSC.

WIEG, WMC, and WPC, known hereafter as Industrial Customer Groups (ICG), jointly filed comments on the draft SEA. ICG expressed grave concerns about the upward



trend in energy rates. Analyzing MISO participation, increasing efficiency and maximizing the use of existing supply side and demand side resources, analyzing the possibility of repealing the moratorium on nuclear generation additions in this state, intervening at FERC to foster wholesale competition, and sending appropriate price signals were ICG's main recommendations. ICG also expressed an interest in receiving from the Commission criteria it will use to prioritize executive policy recommendations filed with the Commission from stakeholders.

## Construction

For construction of generation and transmission facilities, DOT in its comments reminds the Commission that utility construction of thermal generation plants, wind turbine farms and/or high-voltage transmission lines all have potentially adverse impacts on airports. DOT recommends that the proponent of any of these facilities submit information to the Federal Aviation Administration (FAA) and include the FAA's determinations with submittals to the Commission.<sup>23</sup> Mr. Robert Owens, Jr., Ms. Margaret Buchberger, Mr. David Matthews, Ms. Annita Wozniak, and Mr. Richard Pieper, Sr. stress the need to take into consideration carbon limits, coal usage, fuel choice (including biomass and nuclear), landowner concerns, load management programs, and other related issues when planning for the state's energy future.

As We Energies noted in its comments, the expected timing of construction of new renewable facilities, specifically wind generation, presented in the draft SEA report has changed. The data presented in the draft SEA report came from information submitted by energy providers during the summer of 2005 and updates during the early part of 2006. Much has changed. As We Energies notes, there is limited availability of wind turbines in the marketplace, and the federal government is currently analyzing FAA radar interference issues.

## MISO Activities

Many of the suggestions made late last summer by industry participants are becoming reality. Pricing information is being posted in detail. The MTEP06 scope of work includes exploratory studies, reliability assessments, and the review for regional economically beneficial projects. There is also discussion about expanding MTEP's modeling years further into the future. The Commission is actively participating in the MISO and the Organization of MISO States (OMS) regulatory committees and work groups. The Commission also participates in developments at the FERC level. The EPAct05 has also set into motion new activities to explore the more efficient and reliable use of the power network on a much larger scale than one state. It also suggested that regional advisory bodies could be set up between states to coordinate their respective long-term goals. The EPAct05 also appears to preserve states' rights to fulfill resource adequacy compliance. Although the final set of functions and activities have not been detailed at the time of this writing, there will likely be a

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<sup>23</sup> Specifically, DOT explains the process for utilities to submit FAA Form 7460-1, Notice of Proposed Construction of Alteration.

coordinated set of guidelines, standards, business rules, and activities delineated between FERC, the RTOs, the NAERO, the regional reliability councils, and the states.

When asked about MISO's wholesale power market and associated costs and benefits, commenters indicated that it was very difficult or impossible to quantify the costs and benefits of the MISO market. The responses indicate that utility experiences were very different with certain aspects of the new market. Virtually all respondents have significant concerns about MISO administrative costs and with the financial settlement process.

## Transmission

On February 14, 2005, the Commission opened docket 137-EI-100 as a generic investigation into ATC's Access Study Initiative. This docket began as a result of the 2004 SEA, in which the Commission requested comments on what the appropriate amount of transfer capability should be for Wisconsin. At the Commission's direction, ATC filed an updated Access Study Initiative report, which included five representative EHV transmission projects for increasing import capability and one lower voltage alternative. The EHV projects were between 35 and 275 miles long, with construction costs between \$66 million and \$621 million. Commission staff filed a draft report on the Access Study Initiative in November 2005, and stakeholders were given the opportunity to comment on both filings. In March 2006, the Commission concluded the docket and released the Commission staff's final report.

Key observations include:

- ATC and stakeholders concluded that targeting a specific transfer capability value was inappropriate because EHV lines can be used for a variety of system purposes. Consequently, the focus of this docket turned toward the broad policy issues surrounding transmission planning.
- The analysis in the Access Study Initiative was preliminary, but it did suggest that, under certain circumstances, Wisconsin ratepayers could benefit from expanded interstate transmission investment, particularly from investment that is targeted to smaller scale projects.
- With respect to the five EHV alternatives and the one lower voltage option presented in the Access Study Initiative, there was insufficient information to make an informed choice or even select a short list as ATC has requested.
- Assuring that Wisconsin ratepayers benefit from expanded interstate transmission investment requires a rigorous, thorough quantitative and qualitative analysis. That analysis should also include a detailed risk assessment so that matters of professional judgment can be clearly identified and investigated by the Commission.

- New EHV projects should adhere to the principle of protecting the ratepayer from unjust or unreasonable costs or risks.
- EHV applicants should demonstrate significant regional cooperation, planning and public input before applying for a CPCN.

Since the report's issuance, ATC has been further investigating the need for a large scale EHV project for access purposes. In ATC's comments, they indicate that the Paddock-Rockdale 345 kV line is being investigated. ATC originally proposed a Salem-Spring Green-West Middleton project.

## Planning Reserve Margins

The Commission currently requires load serving entities in eastern Wisconsin to maintain an 18 percent planning reserve margin for each upcoming summer season. The 18 percent requirement was adopted by the Commission in Advance Plan 8.<sup>24</sup> NSPW and DPC currently maintain a 15 percent planning reserve which was a requirement of the MAPP reliability council.

Planning reserve margins are an integral part, if not the most important part, of energy planning as it relates to the system and reliability. The Commission recognizes that MISO has changed the way the system is dispatched and what resources are available for Wisconsin electricity providers. We Energies commented that the Commission should continue to play an important role in establishing reserve margins for Wisconsin. MGE offers the possibility that, with the existence of MISO, the required 18 percent reserve margin could be lowered.

It is possible that the planning reserve level in Eastern Wisconsin could be reduced from 18 percent and still meet one day in ten year reliability criterion. At the public hearing nearly all stakeholders were supportive of analyzing the lowering of the 18 percent requirement.

Determining the appropriate level of planning reserves is complicated by three factors. First, there has been a realignment of reliability council membership by the Wisconsin utilities. The evaluation of the appropriate level of planning reserves for Wisconsin will need to take into account the reserve sharing rules that MRO and RFC adopt. Secondly, planning reserves act as a price hedging mechanism for market participants in the MISO Day 2 Market. It may be prudent to carry planning reserves in excess of those necessary to meet a reliability target if those reserves provide a hedge against exposure to high costs in the LMP energy market.<sup>25</sup> Finally, MISO is also considering

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<sup>24</sup> Findings of Fact, Conclusions of Law and Order, docket 05-EP-8, November 20, 1997.

<sup>25</sup> WPPI noted, however, that by 2012 a reduction in reserve margins from 18 to 15 percent would enable a reduction in Wisconsin's installed generation capacity of as much as 500 MW. Assuming conservatively a price of \$500 per kW for new capacity, this would represent an avoided capital investment of \$250 million. As the system becomes more interconnected and more generation comes online, it may even be possible to drop the reserve margin to as low as 12 percent, doubling the potential avoided capital cost to \$500 million. Finally, MISO is also considering the adoption of a resource adequacy requirement for market participants. It is not clear at this time how any MISO resource adequacy requirement will be harmonized with the reserve requirements adopted by MRO and RFC.

the adoption of resource adequacy requirement for market participants. Full details are not clear at this time as MISO will not file its tariff proposals until late in the fall of this year. This issue may be more fully ready for discussion in the next SEA process in 2007-2008. Another option may be for the Commission to set up a separate investigation along the lines suggested by the hybrid planning approach.

## **New Energy Efficiency Concepts**

One benefit of energy efficiency is the impact it can have on the timing and size of new power plants needed in the future. Energy efficiency has also become an increasingly important tool for customers to use in order to reduce their energy bills. The recently passed energy efficiency legislation gives the Commission the responsibility to ensure energy efficiency resources are fully developed. Two steps are needed to ensure that this is accomplished. First, the Commission must, generally through rulemaking, establish the necessary procedures for the development and implementation of energy efficiency programs. These include procedures to set appropriate goals, priorities, and measurable targets and procedures for the review, approval, and evaluation of energy efficiency programs. A second step is to determine the resources, in terms of staffing and tools, the Commission needs to accomplish its energy efficiency mandates. The Commission is moving forward on both steps as it implements Act 141.

## **Renewable Energy Ideas**

Wisconsin has a tremendous opportunity to move toward greater energy independence and stimulate new economic growth by utilizing renewable energy sources. In July 2006, Governor Doyle signed the Wisconsin Declaration of Energy Independence, committing to achieve:

- 25 percent of Wisconsin electricity and transportation fuel from renewable resources by 2025;
- 10 percent share of the national bioproducts market by 2030; and
- National leadership in groundbreaking research on alternative energy.

The Commission applauds this initiative, and will work towards it, as it works through the energy planning process with the state utilities and other regional bodies. DATCP proposed in its comments that between the Wisconsin forestry, paper and pulp sectors, and utilities, the development of biomass for energy production could result in helping our state businesses in global competition. This is consistent with the overall goal of the state to increase the development of Wisconsin-based, renewable energy resources.

The Commission believes that the new Wisconsin Energy Efficiency and Renewable Energy Act (2005 Wisconsin Act 141) recently passed by the legislature and signed by Governor Doyle, presents an excellent opportunity for utilities and state-owned facilities to showcase new renewable energy applications using solar space and water heating, photovoltaics and small wind generators. Many high schools, UW campuses

and vocational colleges are already doing this. All high schools and college campuses in the state should be encouraged to install renewable systems and use them to educate the public as well as their own students. This could be achieved through innovative rate approaches and other service offerings by the utilities. The Commission encourages the state electric utilities to incorporate such service offerings in their rate case applications.

Greater demand for renewable energy systems should encourage the Wisconsin manufacturing sector to become more involved in producing components such as towers, electric generators, gear boxes, and blades for wind turbines and panels; and tracking systems and electronic controls for solar systems. The new 10 percent renewable requirement and Act 141 encourage greater use of anaerobic digestion to fuel electrical generation on farms with large numbers of animals. The Commission will continue to support these renewable efforts.

### **Aging Workforce**

The Commission recognizes the national reality of this country's aging workforce. The Utility Workers Coalition, in its comments, provided very specific detail regarding this phenomenon and how preventive maintenance of the utility infrastructure may be affected. Quality regulatory review and intervention is a part of what is required, in total, to continue safe and reliable utility service for the customers of this state as well as utility employees. The Commission plans to work with all industry participants to transition through this time of demographic population change. Partnership and cooperation is required, as all parties have the same desired end—safe and reliable service.

### **Mitigating Electric Rate Increases in a Period of Significant Additions to Infrastructure**

In Wisconsin, electricity demand from consumers is rising. While this is a positive sign that the economic health of Wisconsin is strong, it has resulted in the need to improve the infrastructure that serves consumers, which in turn puts upward pressure on rates. In addition, the cost of fuel is rising, another significant factor in the present era of rising utility rates. The Commission will be proactive in keeping utility rates as low as reasonably possible, while preserving electric reliability and protecting the public trust. One of the rate policy matters that the Commission is pursuing focuses on making sure price signals are proper when designing rates. This is being done within the generic investigation opened in 2005 regarding electric cost-of-service studies. In addition, the Commission is analyzing the possible retooling of electric fuel rules in order to provide utilities proper incentives to control electric generation fuel costs, as described later in this report. Also, the Commission is heavily involved in analyzing the performance of the MISO market, especially as it relates to what Wisconsin's electric utility customers ultimately pay for electricity.

For the future, the Commission may explore new rate options that will allow customers to reduce their electric bills. The key to these new rate options will be to provide

customers with the appropriate incentives so they have the opportunity to reduce usage during high cost periods and increase usage during low cost periods. Current time-of-day rates have simple on-peak and off-peak pricing periods. These time-of-day rates could be modified to include additional pricing periods so that the rates could more closely track costs. Wisconsin has limited experience with real-time pricing. Two utilities offer real-time pricing, but only one customer takes service under a real-time pricing tariff. Under real-time pricing, rates are determined a day in advance for each hour of the succeeding day. Wisconsin has significant experience with interruptible rates. Interruptible rates are primarily used by large industrial customers. New metering and communication technologies may provide an opportunity for smaller customers to take advantage of real-time pricing and interruptible rates. The MISO Day 2 Market provides hourly LMPs that could be used as the basis for new time-of-day, interruptible and real-time pricing rate options.

The Commission continues to perform ongoing analysis of its own regulatory processes as it relates to ratemaking, making sure that the regulatory impact on utility ratepayers and the utilities themselves is positive. Rate case procedures within the Commission itself will always have the ability to change, in order to complement the changing marketplace and regulatory environment.

### **Ratemaking for Electric Generation Fuel Costs**

Prior to April 1, 2005, each large integrated electric utility in Wisconsin dispatched its own generation and scheduled purchases on a daily basis to meet its own load. On April 1, 2005, MISO instituted the operation of a bid-based security-constrained energy market in the MISO footprint. This energy market, along with the associated market rules, is known as the MISO Day 2 Market. In addition, portions of northern Illinois are part of PJM, which operates a similar Day 2 Market. The PJM market affects Wisconsin utilities because they must participate in it in order to schedule energy from purchased power contracts based on generating resources located in Northern Illinois.

The MISO Day 2 Market (and the PJM market) resulted in new streams of revenues and costs for Wisconsin utilities. The interaction of the MISO Day 2 costs and revenues with the fuel rules, and previous deferrals and escrows granted by the Commission in various proceedings, involve complex accounting and ratemaking issues.<sup>26</sup> The Commission staff has been working with the large investor-owned utilities since January 2004 on the accounting and ratemaking issues related to the MISO Day 2 Market with the objective of developing a long-term policy for rate treatment of the Day 2 costs and revenues.

The Commission will adopt policies to properly classify these costs and revenues and determine which costs and revenues should be reflected in base rates, and which

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<sup>26</sup> In addition to deferrals related to MISO Day 2 costs and revenues, the Commission previously granted MGE, WEPCO, WP&L, and WPSC a five-year escrow for certain costs associated with the start-up and operation of ATC in an order issued on October 23, 2002, in docket 05-EI-129. This escrow expired on December 31, 2005. When MISO began operations, it assumed certain functions from ATC. Commission staff has interpreted the so-called "ATC deferral" to include the costs of these functions which are now billed by MISO.



should be treated as monitored costs under the “fuel rules.”<sup>27</sup> This distinction is important because rates can be adjusted between base rate cases for changes in the cost of “fuel,” whereas changes in other costs cannot be reflected in rates without a base rate proceeding. The Commission has opened a docket to analyze these complex issues.<sup>28</sup>

## **CITIZENS’ GROUPS CRITIQUE OF THE STRATEGIC ENERGY ASSESSMENT REGULATORY MODEL**

In this proceeding two citizens’ groups provided substantial comments on the draft SEA. The first group was the Joint Public Intervenor (JPI) which represented the following advocacy organizations: CUB, Clean Wisconsin, and RENEW Wisconsin. The second group was the Citizens for Responsible Energy (CRE), an association of members of the public from Dane County.

The following sections briefly summarize the comments of JPI and the CRE. The following discussion essentially contains a dissenting theme that the present SEA process is defective, including the data and analysis presented earlier in this report. The nature of the claimed defects are that: (1) the present SEA and process do not properly take into account strategic planning that would better acknowledge all of the costs of producing and using electricity; and (2) there is no meaningful prior opportunity for public input on either generation or transmission planning which would allow an informed discourse on more appropriate alternatives. These citizens’ groups believe the present processes favor utility generation and transmission applications because it is only after an application is filed with the Commission that technical and public reviews begin. By statute such processes are time limited, further preventing an appropriate delineation and analysis of alternatives. These citizens’ groups, in general, favor the increased use of energy efficiency, renewable energy resources, demand response programs, distributed generation, and/or inclining rate pricing structures to either attenuate growth in electricity demand or to outright eliminate the need for new electricity generation sources that use fossil fuel. Both citizens’ groups place strong emphasis on the large externality costs to public health or the environment by the use of nuclear units, fossil-fueled generation, or the construction of new high voltage transmission lines.

JPI indicates that it wants to work “with the Commission and other stakeholders to improve the ability of Wisconsin ratepayers to enjoy reasonably priced, reliable, adequate, and environmentally appropriate energy services.” JPI believes “success of such efforts is fundamental to protecting the environment, and ensuring a sustainable economy and high quality of life for Wisconsin residents and businesses.” Future energy resource choices in JPI’s view “involve difficult trade-offs, including the need at times to incur higher costs now to avoid far higher future costs and rates as well as potential near- and long-term economic, environmental and social disruptions.” JPI

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<sup>27</sup> The fuel rules are specified in Wis. Admin. Code PSC ch. 116.

<sup>28</sup> Docket 9300-EI-100.

states, “[t]hese efforts would be facilitated by an improved and enhanced strategic assessment process that better informs a public strategic planning process to ensure a flexible and adaptive resource infrastructure.” Specific actions the JPI believes are necessary are:

“Increase the time frame covered by the strategic assessment to cover a longer [15 to 20 year] period.”

“Improve the scope, quality, reliability, availability and transparency of the information underlying the strategic assessment so that all interested persons can work off the same set of facts.”

“Change the strategic assessment from a process based on limited interaction, information, and analysis to a process that seeks to acquire specific detailed opinions and analyses from a wide variety of [organizations and stakeholders].”

JPI recommends “that the Commission invite distinguished experts to make presentations on important topics so that the Commission, the public, and others can understand the likely context for Wisconsin's potential energy futures.” This approach would use “a non-contested case process with Staff and Commissioners serving as the questioning panel.” This dialogue would then form the basis for the final SEA. JPI believes this process would more appropriately “address all of the statutorily-required questions and their implications for potential energy futures and potential areas for further inquiry or development.”

“Commence such a ‘special’ non-contested strategic assessment process, as outlined above, as soon as possible.” At the same time the Commission should “revamp the [present rules] framework for the next SEA.”

JPI recommends embracing a more open, public input process with a forward-looking feature, allowing results from the SEA to inform strategic planning processes that occur in other energy issue areas. For instance, the JPI embraces a proceeding or Commission action to lower the present 18 percent planning reserve requirement to 15 percent. Additionally, transmission planning would be conducted in a timely, proactive manner to identify and implement effective alternative options prior to any construction applications. The range of options would include energy efficiency programs, load management/demand response initiatives, innovative rate structures, and promotion of renewable energy perhaps using “feed-in” tariffs.

The new strategic assessment process envisioned by JPI would:

- Forecast electricity use and demand, and clearly explain the drivers that affect the projections.
- Benchmark electricity use and demand forecasts to appropriate economic and demographic information.



- Present both historic and weather-normalized data regarding electricity use and demand.
- Provide a comprehensive analysis of electricity rates and utility cost drivers.
- Incorporate an adequate description or discussion of the primary risks and uncertainties affecting Wisconsin's electricity future. Such factors would include increased and volatile fossil fuel prices; adverse environmental, social, and economic impacts from the use of fossil fuels, which are causing global warming concerns; and the growing reliance on unproven regional markets for electricity that may not be able to provide adequate supplies of electricity at reasonable prices.
- Create “a public strategic action plan to ensure that Wisconsin has an adequate, robust infrastructure of supply- and demand-side options for serving present and future interests of Wisconsin’s energy ratepayers.” This step would involve a review of the primary uncertainties, risks, and opportunities facing present and future Wisconsin ratepayers and how to best address such issues.

CRE raised specific concerns about the draft SEA and criticized the claimed fundamental pro-growth and pro-construction bias inherent in the present SEA as well as construction application processes. CRE also faults the current institutional arrangement whereby the present load serving electric utilities essentially tell ATC to expand transmission service due to growth in electricity usage. CRE also believes action is needed by the Commission to more appropriately define the public interest and public good to include consideration of physical resource limits, environmental impacts, large social costs of transmission construction, eventual compliance with Kyoto-type accords with respect to green gas emissions, and other externalities. CRE emphasizes that “the assumption that continued growth is inevitable and in the public good must be challenged and evaluated.” To address its concerns, CRE proposes specific remedies as discussed below.

In terms of the SEA’s fact finding, CRE believes that the assessment does not use clear definitions of how the Commission is gauging the reliability or adequacy of the state’s integrated electric system.

CRE also believes that the demand and energy forecasts put forth by the utilities and compiled in the SEA need further scrutiny and are unreasonably high given the constraints emerging in resource availability and monetary policy. CRE believes the SEA forecast should receive a comprehensive examination in terms of the process utilities used in their forecasting as well as the necessary inputs used to develop such forecasts. CRE indicates that there was “no significant vetting of assumptions on the declining physical supplies of fossil fuels, the anticipated real price increases for such fuels, or on the economic activity consequences of these factors relating to world political events and financial issues.” According to CRE, natural gas production is declining in North America, world oil production will peak within the next seven years of the current SEA time horizon, and “the vast majority of [the] developed world

economies have recognized” and are implementing policies to reduce emission levels of green house gasses.

CRE believes that it is imperative to decrease energy usage. The SEA should focus on that goal and “not to debate how to manage the price shocks implied by the unfettered rush to build additional electric infrastructure.” CRE proposes a mechanism to address the above concerns and believes that the Commission as part of this SEA and in other proceedings should embrace that mechanism. Specifically, CRE suggests that customers receive “consistent and robust price signals for all levels of electric service [because it] is absolutely critical to producing appropriate market behavior.”

CRE notes that creation of the SEA and the demise of the Advance Plan process was “predicated on the notion that market forces are a more efficient and sophisticated approach to electric infrastructure investment.” According to CRE, “the present state of ratemaking falls well short of this [market-forces] requirement.” The present failure “to appropriately price service at the time of peak demand allows the utilities to over invest in peaking generation and high voltage transmission lines rather than encourage cost-effective customer investments and behavior.”

One particular method that would begin to address such electricity mis-pricing is to create rate designs using inclining rates according to CRE. Inclining rates refers to the situation where the electricity price increases as usage increases. CRE advocates that “inclusion of inclining block rates where a significant percentage of total sales within a rate class are at the full long-term avoided cost of production would send a powerful signal to providers of services that reduce reliance on traditional utility service.” Such price signals would likely lead to a reduction in electricity demand and further promote alternative generating resources such as renewables.

CRE indicates that another mechanism necessary to accomplish the objectives outlined above would be to change the process in which load serving utilities request transmission service from ATC. Specifically, CRE proposes “requiring utilities to nominate a specific demand consistent with FERC proposed funding of new transmission investments.” This nomination procedure along with aforementioned pricing mechanism according to CRE would remove “the obvious conflict to interest that exists today where assumptions of high growth in demand serve the interests of ATC to invest in greater transmission capacity.”

Finally, CRE believes the Commission should establish a clear definition of what is in the public interest and what constitutes the public good. Specifically, CRE believes the definition should embrace the goals of capping “peak demand at the present level,” limiting “fossil-fuel generation at present levels,” achieving “the various standards of the Kyoto accords,” and restricting “real energy costs as a percentage of Wisconsin’s economic activity [to] present levels.” Essentially CRE advocates for “new approaches to regulation that shift utility incentives so that utilities favor a decrease in [electricity] usage, a decrease in emissions, [and] a decrease in consumption as a measure of the good life.”

## **FUTURE DIRECTION**

This SEA shows that Wisconsin is likely to have an adequate, reliable, and cost-effective supply of resources to meet electricity demands during the 2006 to 2012 period. This is the result of the Commission's actions to approve needed new generation and transmission facilities, many of which are completed or under construction.

As with prior SEAs, the deliberative and public process that led to this final report has revealed a number of topics that the Commission should take up for further study and possible action.

### **Expand the SEA Reporting Period from Seven to Ten Years**

Presently, the Commission prepares an SEA using seven years of expected supply and generation data from the state's electricity providers and transmission owners. Several commenters suggested the Commission expand the reporting requirement to ten years, or more. Using a ten-year reporting period would dovetail with the planning horizons used by both MISO and ATC. Adopting a ten-year reporting period would align the SEA's results with those of MISO and ATC, allowing an easier side-by-side comparison. The Commission will open a docket to revise the relevant rules in Wis. Admin. Code ch. PSC 111 to expand the reporting period from seven to ten years.

### **Commence an Investigation Regarding Appropriate Planning Reserve Requirements**

Many commenting on the SEA suggested that the Commission revise the present requirement that electricity providers maintain at least an 18 percent planning reserve margin. This requirement was set in November 1997 as an Order Point in Advance Plan 8. Utilities, public advocacy groups, and industrial customers believe it is time for the Commission to reexamine whether requiring 18 percent planning reserves is appropriate. Some commenters believe it is too expensive to maintain, especially with the fruition of the wholesale energy market under MISO. Reexamining the planning reserve requirement would be timely, as MISO is presently exploring additional avenues to maintain resource adequacy in the region. Wisconsin must not be in the position of subsidizing other region's capacity needs. At the same time, the state does need to meet its demand obligations within an area that presently operates with transmission constraints. The Commission will open a docket to investigate whether the planning reserve requirements should be changed.

### **Increase Wisconsin's Focus on Demand Response Options**

Wisconsin is a national leader in the creation and use of demand response programs. Giving customers the tools they need to shape their own demand curve must be a critical component of the state's energy future. Through time-of-day pricing, load control programs, and interruptible and curtailable load programs, the Commission

has made demand response an important part of the multifaceted approach to meeting the state's energy demands on the days that most tax the system.

More should be done. MISO needs to support demand response programs in day-ahead and real-time energy markets. Wisconsin's efforts to expand demand response need to be synchronized with the programs developed by MISO. MISO needs to acknowledge the critical role that Wisconsin's advanced demand response programs play in supporting the MISO footprint on high demand days. The Commission will continue to work with MISO and the Wisconsin stakeholders to ensure that demand response availability continues to serve the best interests of Wisconsin ratepayers.

### **Work with Utilities and Labor Groups to Address Utility Workforce Planning Challenges**

Reliable delivery of utility services depends upon an adequate, well-trained utility workforce. As in other sectors of the economy, the utility workforce is aging. Replacing those skilled workers who retire will not happen without careful consideration of the dynamic labor needs of the industry and the ability to successfully recruit employees to the industry. The Commission has opened a dialogue with the Wisconsin Department of Workforce Development to explore training and education opportunities that may benefit utility workforce planning. The Commission will continue to facilitate cooperation among the utilities, relevant state agencies, and other organizations to ensure that attention and resources remain focused on this important topic.

## ACRONYMS

§	Section
Act 9	1999 Wisconsin Act 9
Act 141	2005 Wisconsin Act 141
AFUDC	Allowance Funds Used During Construction
ATC	American Transmission Company LLC
Btu	British thermal units
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CC	Combined-cycle
CE	Commonwealth Edison Company
Commission	Public Service Commission of Wisconsin
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CPCN	Certificate of Public Convenience and Necessity
CRE	Citizens for Responsible Energy
CT	Combustion turbine
DEK	Dominion Energy Kewaunee
DNR	Department of Natural Resources
DOA	Department of Administration
DOE	U.S. Department of Energy
DOT	Department of Transportation
DPC	Dairyland Power Cooperative
ECAR	East Central Area Reliability Coordination Agreement
ECW	Energy Center of Wisconsin
EHV	Extra High Voltage
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
EPRI	Electric Power Research Institute
ERF	Electronic Regulatory Filing
FERC	Federal Energy Regulatory Commission
FOE	Focus on Energy
Forward	Forward Energy LLC
FTR	Financial transmission rights
GW	Gigawatt
GWh	Gigawatt hour
HVAC	Heating/ventilating/air conditioning
ICF	ICF Resources, LLC
IGC	Industrial Customer Groups
IGCC	Integrated gasification combined-cycle
IPP	Independent power producers
JPI	Joint Public Intervenor
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt hour
LIHEAP	Low Income Home Energy Assistance Program
LMP	Locational marginal pricing
MACT	Maximum achievable control technology
MAIN	Mid-America Interconnected Network
MAPP	Mid-Continent Area Power Pool

MGE	Madison Gas and Electric Company
MISO	Midwest Independent Transmission System Operator
mmBtu	Million British thermal units
MTEP05	MISO Transmission Expansion Plan 2005
MTEP06	MISO Transmission Expansion Plan 2006
MPU	Manitowoc Public Utility
MRO	Midwest Reliability Organization
MW	Megawatt
MWh	Megawatt hour
NAERO	North American Electric Reliability Organization
NERC	North American Electric Reliability Council
NO <sub>2</sub>	Nitric oxide
NO <sub>x</sub>	Nitrogen oxides
NSPW	Northern States Power-Wisconsin
Ohio PUC	Ohio Public Utilities Commission
OMS	Organization of MISO States
PJM	PJM Interconnection
PM	Particulate matter
PM <sub>10</sub>	Particulate matter less than 10 microns in diameter
PM <sub>25</sub>	Particulate matter less than 25 microns in diameter
PSC	Public Service Commission of Wisconsin
PTC	Production tax credit
PUHCA	Public Utility Holding Company Act
PURPA	Public Utility Regulatory Policy Act of 1978
PV	Photovoltaic
RFC	ReliabilityFirst Corporation
ROW	Right-of-way
RTO	Regional Transmission Organization
RPS	Renewable portfolio standard
SCPC	Super-critical pulverized coal
SEA	Strategic Energy Assessment Report
SERC	Southeast Reliability Council
SO <sub>2</sub>	Sulfur dioxide
SO <sub>x</sub>	Sulfur oxides
SWL&P	Superior Water, Light and Power Company
TO	Transmission Owner
TVA	Tennessee Valley Authority
U.S.	United States
WEPCO	Wisconsin Electric Power Company
WIEG	Wisconsin Industrial Energy Group
Wis. Admin. Code	Wisconsin Administrative Code
Wis. Stat.	Wisconsin Statutes
WMC	Wisconsin Manufacturers and Commerce
WP&L	Wisconsin Power and Light Company
WPC	Wisconsin Paper Council
WPPI	Wisconsin Public Power, Inc.
WPSC	Wisconsin Public Service Corporation
WUMS	Wisconsin Upper Michigan System
Xcel	Xcel Energy Inc.

## GLOSSARY

Capacity	The maximum amount of power that a generating unit can create, usually measured in MW.
Capacity Factor	A calculation, expressed as a percentage such as 70 percent, representing the proportion of time in a year that a generating unit operates at its full electric generating output level.
Demand and Energy Charge	The combined fixed costs for the right to obtain capacity as well as the energy charges that are incurred to produce electricity.
Electric Demand	The amount of instantaneous draw of power from the electric system, usually measured in MW.
Electric Energy	The amount of electricity used over a period of time, measured in MWh.
Energy Charge	The variable costs, including fuel, that are incurred to produce electricity.
Flow Gate	A particular section of the transmission system where energy is monitored for excessive flow.
Focus on Energy Program	Energy efficiency and conservation program administered by the state Department of Administration and funded by the state's electric and gas utilities.
Independent Power Producer (IPP)	A non-utility business that constructs and operates power plants, who sells the electrical output into the marketplace.
Marginal Energy Cost (MEC)	The cost of electric energy for the last unit produced, usually measured in \$ per MWh. The MEC is usually comprised of fuel cost, and variable operation and maintenance costs.
Native Load	The amount of electric demand, representing the customers in its service territory that a utility is obligated to serve.
Peak Electric Demand	The amount of instantaneous draw of power from the electric system at the moment of highest use, usually on a hot humid summer day.
Power Purchase Agreement (PPA)	A contract in which an electric generating company sells capacity and energy to a utility.
Therm	A unit used to measure the quantity of heat that equals 100,000 Btu.
Transfer Capability	The amount of electrical output measured in MW that can move over a set of high voltage transmission lines from one area to another.
Sales and Purchases on a Unit Basis	The exchange of electric power and energy from a dedicated generation plant.
Sales and Purchases on a System Basis	The exchange of electric power and energy from a provider's fleet of generation plants.
Simultaneous Transfer Capability	The amount of electrical output measured in MW that can move over all sets of high voltage transmission lines at the same time from one area to another.
With or Without Reserves	A contract specification for an exchange of power and energy in which the seller does or does not provide the additional capacity required so that the sale has the same high level of dispatch priority as native load.





# APPENDIX A

Table A-01 New Utility-Owned or Leased Generation Capacity, 2005-2014

Year	Owner	Project Description	Fuel	Location	Capacity (MW)
2005	WEPCO	Port Washington unit 2 Combined Cycle	Natural Gas	City of Port Washington, Ozaukee County	545
2005	WP&L	Sheboygan Combustion Turbines	Natural Gas	Town of Sheboygan Falls, Sheboygan County	300
2005	MGE Power, LLC	West Campus Cogeneration Facility	Natural Gas	City of Madison, Dane County	150
2005	Calpine	Fox Energy Combined Cycle	Natural Gas	City of Kaukauna, Outagamie County	300
2006	Calpine	Fox Energy Combined Cycle	Natural Gas	City of Kaukauna, Outagamie County	240
2006	Manitowoc	Fluidized Bed Boiler	Coke	City of Manitowoc, Manitowoc County	58
2006	Invenergy	Forward Wind	Wind	Towns of Byron, Oakfield, Lomira, and Leroy Dodge and Fond du Lac Counties	200
2007	WP&L	Cedar Ridge*	Wind	TBD	98
2008	WEPCO	Blue Sky / Green Field	Wind	Towns of Calumet and Marshfield, Fond du Lac County	203
2008	WEPCO	Port Washington unit 1 Combined Cycle	Natural Gas	City of Port Washington, Ozaukee County	545
2008	WPSC	Weston SCPC Coal Unit 4	Coal	Villages of Rothschild and Kronenwetter, Marathon County	515
2009	WEPCO	Elm Road SCPC Coal Unit 1	Coal	City of Oak Creek, Milwaukee County	615
2010	WEPCO	Elm Road SCPC Coal Unit 2	Coal	City of Oak Creek, Milwaukee County	615
2010	WPPI	Prairie State Energy Campus Coal	Coal	Southern Illinois	50
2011	WEPCO	Point Beach 1 and 2 Nuclear Upgrade	Nuclear	Town of Two Creeks, Kewaunee County	100
2012	WP&L	Baseload Plant	Coal	Grant or Portage Counties	250
TBD**	WPSC	Baseload Plant	Coal	Marathon or Portage Counties	TBD
<b>Total Capacity Additions 2005-2011</b>					<b>4,784</b>

\*WP&L is undecided whether this will be owned or purchased.

\*\*Construction may begin before 2012.

Table A-02 High-Voltage Transmission Lines and Upgrades/Rebuilds of Lines Designed to be Greater Than 100 kV – Construction Expected to Begin Prior to December 31, 2012

Endpoint 1 Substation	Endpoint 2 Substation	Midpoint Connection (if any)	Operating Voltage (kV)	Est. Cost (Millions)	Expected Construction Start Date	Expected In-Service Date	New ROW Required	Substation Modifications Required	PSCW Status and Docket Number
<b>ATC Transmission Lines</b>									
Arrowhead	Weston (Gardner Park)	Stone Lake	345	\$420.0	Under Construction	Jun-08	Yes	Yes	Approved 05-CE-113
Hiawatha	Indian Lake		138	\$49.6	Under Construction	Jun-09	No	Yes	Michigan Project
Columbia	North Madison		345	\$30.6		Mar-06	No	Yes	Approved 137-CE-119
Morgan	Stiles	Falls, Pioneer	138	\$8.0		May-05	No	No	Approved 137-CE-130
Plains	Stiles	Amberg	138	\$100.4	Dec-04	Dec-06	No	No	Approved 137-CE-124
Martin Road	South Fond du Lac/ Ohmstead		138	\$1.6	Jul-05	Jun-06	No	Yes	
North Beaver Dam	East Beaver Dam		138	\$2.3	Jan-06	Jun-06	No	Yes	Approved 137-CE-131
Turtle	West Darien		69	\$6.9	Jan-06	Jun-06	No	Yes	Approved 137-CE-128
Southwest Delavan	Bristol		69	\$7.7	Sep-06	Jun-07	No	Yes	Approved 137-CE-136
Sycamore	Sprecher	Reiner	138	\$5.9	Apr-06	Mar-07	No	Yes	Approved as part of 137-CE-120
Sprecher	Femrite		138	\$22.0	Under Construction	Feb-07	No	Yes	Approved 137-CE-120
Cranberry	Conover		115	\$17.1	Oct-06	Dec-09	Yes	Yes	137-CE-125
Jefferson	Stony Brook		138	\$23.0	Oct-07	Jun-08	No	Yes	Approved 137-CE-121
Kegonsa	Femrite	McFarland	138	\$3.4	Oct-06	Feb-07	No	Yes	
Plymouth #4	Forest Junction/ Howards Grove		138	\$2.5	Nov-06	May-07	Yes	Yes	Approved 137-CE-143

Endpoint 1 Substation	Endpoint 2 Substation	Midpoint Connection (if any)	Operating Voltage (kV)	Est. Cost (Millions)	Expected Construction Start Date	Expected In-Service Date	New ROW Required	Substation Modifications Required	PSCW Status and Docket Number
Venus	Metonga		115	\$8.7	Dec-06	Jun-07	No	Yes	Approved 137-CE-126
Gardner Park	Central Wisconsin		345	\$122.0	Jan-07	Dec-09	No	New Substation	Approved 137-CE-122
Canal	Dunn Road		138	\$6.4	Feb-11	Jun-12	No	Yes	137-CE-140
West Darien	Southwest Delavan		69	\$5.9	Under Construction	Apr-07	No	Yes	Approved 137-CE-117
Hiawatha	Mackinac (Straits)	Pine River	138	\$73.2	May-07	Jul-09	No	Yes	Michigan Project
Gardner Park	Hilltop		115	\$16.0	Jun-07	May-07	No	Yes	Approved 137-CE-135
Rock River	Elkhorn	Bristol	138	\$8.3	Aug-08	Jun-09	No	Yes	137-CE-150
Rockdale	West Middleton		345	\$131.0	Dec-09	Jun-11	Yes	Yes	137-CE-147
Morgan	Werner West		345	\$141.0	Oct-07	Dec-09	No	No	Approved 137-CE-123
Saukville	St. Lawrence	Pleasant Valley	138	\$9.9	Oct-07	May-08	No	No	137-CE-145
Conover	Plains		138	\$99.3	Jan-08	Sep-09	No	Yes	137-CE-125
North Madison	Waunakee-Huiskamp		138	\$12.0	Jan-08	Jun-08	Yes	Yes	137-CE-139
Rubicon	Horicon	Hustisford	138	\$16.0	Jan-08	Jun-08	Yes	Yes	137-CE-138
Verona	Oak Ridge		138	\$21.8	Nov-07	Jun-09	Yes	Yes	
Waunakee-Huiskamp	Blount		138	\$20.0	Oct-11	Jun-12	No	Yes	137-CE-139
Salem**	West Middleton	Spring Green	345/138	\$297.2	Jan-11	Jun-13	Yes	Yes	
West Middleton	North Madison		345	\$46.7	Jul-14	Jun-16	Yes	No	
<b>NSPW Transmission Lines</b>									
Border	Chisago County	St. Croix Falls	161	\$15.2	Jul-05	Dec-05	No	Yes	
<b>Dairyland Power Cooperative Transmission Lines</b>									
Apple River	Chisago, MN	Lawrence Creek, MN	161/115	\$11.6	Jul-08	Dec-10	No	Yes	Approved 1515-CE-102 4220-CE-155
**This is a representative ATC access project. ATC has not determined which access project would likely be filed									

**Table A-03 Proposed High-Voltage Transmission Line Projects Involving New Rights-of-Way, Excluding Projects with CPCN Applications Already Filed with the PSC**

Project	Voltage (kV)	New ROW Length (mi)	Screening Area <sup>1</sup> (sq mi)	Corridor Sharing Opportunities	Public Lands	Sensitive Resources	Cultural Resources <sup>2</sup>	Miscellaneous
Rockdale-West Middleton	345	28	290	New ROW will be required. State and county roads and existing transmission ROWs	Numerous city, county, and state parks including Indian Lake, LaFollette, and Festbe County Parks, Governor Nelson, and Lake Kegonsa State Parks, portions of the Glacial Drumlin State Trail, and several state fishery and wildlife areas	Bean Lake, Red Cedar Lake, and the Hook Lake/Grass Lake state natural areas, and much of the Yahara River drainage basin	The Koshkonong Norwegian Settlement, Bernard-Hoover Boar House, Robert M. LaFollette House, Gilmore House, Olin House, the State Capital, several effigy mound sites, numerous museums, and the Langdon Street, Sherman Avenue, Third Lake Ridge, and Universi	
Fitchburg - Verona	138	9	63	County and local roads, and a recreational trail	Nevin Hatchery, Brooklyn Wildlife Area, and a WDNR recreational trail are located within the screening area.	The Sugar River and associated wetlands, Story Creek, and other unnamed streams and wetlands	Architectural and historic sites	Moderate probability of encountering endangered resources.
Salem-Spring Green-West Middleton	345	114	2480	Numerous highways and local roads, existing transmission ROWs, and railroad corridors	Nelson Dewey State Park, Governor Dodge State Park, Tower Hill State Park, Bluemounds State Park, Blackhawk Lake Recreational Area, Turkey River Mounds State Park (IA), White Pine Hollow State Forest Preserve (IA), Lower Wisconsin State Riverway, numero	Upper Mississippi River National Wildlife and Fish Refuge, Lower Wisconsin State Riverway, numerous Wisconsin State Natural Areas, several State Preserves and recreational areas, the Mississippi and Wisconsin Rivers and their tributaries, and various othe	High potential for encountering cultural and historic resources	
West Middleton-North Madison	345	20	42	State highways 12, 14, 113, and 19, county highways and electrical distribution ROWs	Lodi Marsh wildlife area, county and local parks.	Pheasant Branch, Black Earth Creek, Halfway Prairie Creek, Sixmile Creek, tributaries to the Yahara River, Brandenburg Lake, Lodi Marsh State Natural Area.	None	Morey Airport

1 - Screening Area Width is defined as follows:

For lines 0 to 5 miles long, the screening area width equal length of segment;

For lines 5 to 15 miles long, the screening area width equals 5 miles;

For lines greater than 15 miles, screening area width equals 30 percent of line length.

2 - Cultural Resources are those resources listed on the statewide cultural resource map.